

MONTANA DEPARTMENT OF TRANSPORTATION

STATEWIDE

Roadside Vegetation Management Plan

Integrated Weed Management Component
2006 - 2011



MONTANA DEPARTMENT OF TRANSPORTATION MAINTENANCE DIVISION
HELENA, MONTANA



Montana Department of Transportation

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Jim Lynch, Director
Brian Schweitzer, Governor

April 2006

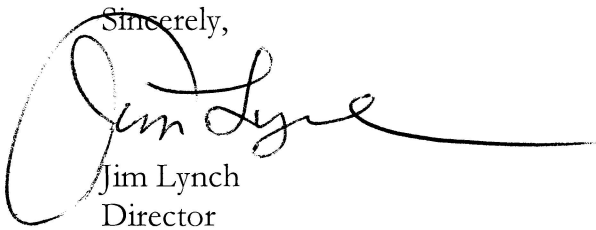
Greetings,

The Montana Department of Transportation's *Roadside Vegetation Management Plan* is the implementation of Governor Schweitzer's *Montana Weed Management Plan*. A cornerstone of our weed management plan is education to increase awareness of real and potential impacts to Montana's heritage.

Vehicles traveling along Montana's highways play an active role in the dispersal of noxious weeds. These non-native plants are jeopardizing Montana's future for recreation, agricultural productivity, and economic prosperity. MDT's plan provides specific actions to ensure healthy and diverse vegetation along Montana's roadsides.

I am pleased to offer the *Roadside Vegetation Management Plan* to all Montanans as we work together to ensure a balanced and diverse landscape for today and future generations.

Sincerely,



Jim Lynch
Director

Montana Department of Transportation Roadside Vegetation Management Plan *Integrated Weed Management Component*

April, 2006

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Helena, MT

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Chapter 1

Purpose and Need for Action



Chapter 1. Purpose & Need for Action

INTRODUCTION

Highway rights-of-way are high-risk sites for introduction, establishment, and spread of noxious weeds. Weeds can be carried on vehicles, in the loads they carry, and on construction and maintenance equipment. They can be inadvertently introduced into rights-of-way during restoration projects by use of contaminated mulch, soil or gravel, plant seed, and sod. Historically, some invasive plant species have been deliberately planted in erosion control, landscape, or wildflower projects. Weeds established on roadsides can spread into adjacent non-infested areas and can also be transported to surrounding counties and states. It is critical to develop a comprehensive integrated management plan to address noxious weed issues on approximately 156,000 acres of highway rights-of-way owned by Montana Department of Transportation (MDT).

For purposes of this document, a weed is defined as any plant that interferes with management objectives for a given area of land (or body of water) at a given point in time. Once a plant has been classified as a weed, it attains a “noxious” status by rule as described in the County Weed Control Act (7-22-2101 (8)(a)(i), MCA). The Montana County Weed Control Act defines a "noxious weed" as any exotic plant species established or that may be introduced into the state which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses and is further designated as either a state-wide or county-wide noxious weed.

Montana Department of Transportation in cooperation with County Weed Districts and Montana Department of Agriculture developed criteria for managing weeds on roadsides. MDT recognizes that objectives, expected results, and needs of each county may vary. Overall purpose and objectives will remain consistent throughout Montana.

PURPOSE

The purpose of MDT’s Statewide Roadside Integrated Weed Management Plan is to guide ecologically-based integrated weed management strategies on roadsides that strengthen and support national, state, city and county roadside vegetation management objectives. This Management Plan provides a conceptual framework and recommendations for actions to reduce existing infestations, maintain low noxious weed soil-seed bank levels, reduce susceptibility of road rights-of-way to weed establishment, and manage spread of noxious weeds along state roads in Montana. This document was developed to meet state statute (7-22-2151, MCA), and provide guidance and direction to MDT while maintaining flexibility for local priorities and actions on a countywide level.

OBJECTIVES

Objectives of the roadside integrated weed management plan are to provide overall direction to MDT and include:

1. Promote healthy, low maintenance, and self-sustaining roadside vegetation while maintaining right-of-way safety and function.
2. Prioritize roadside noxious weed management strategies by species, abundance, and location statewide.
3. Develop and implement action items that support integrated noxious weed management components on roadsides statewide.
4. Conduct a statewide inventory and develop a database for noxious weeds on roadsides.

5. Develop stable long-term funding to support implementation of Integrated Weed Management on state road rights-of-way.

This Plan is a dynamic document that integrates: 1) needs of local communities and highway users; 2) knowledge of plant ecology and natural processes; 3) design, construction and maintenance considerations; 4) government statutes and regulations; and 5) technology. Specific objectives, issues, and programs are discussed to improve weed management efforts on roadsides, foster coordination between county and state entities, and increase public awareness about noxious weed issues. Expected results of the weed management program are identified.

NEED FOR ACTION

Rate of introduction and spread of noxious weeds has increased dramatically over the past 150 years as human activities, trade, and commerce have increased. Transportation corridors serve as a critical avenue for introduction, establishment, and spread of weeds throughout Montana (Chicoine 1984; Forcella and Harvey 1983; Losensky 1989). A study conducted on spotted knapweed by Montana State University indicated that a vehicle driven several feet through a knapweed site acquires up to 2000 seeds (Trunkle and Fay 1991). These seeds are dispersed along highways, with about 200 seeds remaining on a vehicle after driving 10 miles. The Montana legislature identified vehicles and associated transportation routes as major vectors of noxious weed introduction and spread to adjoining lands. In 1987 and 1989, they approved an annual \$1.50 per vehicle fee on all motor vehicles registered in Montana to be used to fund weed management projects through the Noxious Weed Trust Fund Program.

Once established on roadsides, noxious weeds spread rapidly to adjoining cropland and wildland areas infesting thousands of acres (Losensky 1989, Tyser and Key 1988; Duncan et al 2001). Currently there are 27 weeds on Montana's noxious weed list that infest about 8.2 million acres in the state (Duncan 2005).

The impact of weeds on biological communities, ecosystem processes, and the agricultural economy is well documented in Montana. Studies have shown that replacement of native bunchgrasses with taproot weeds such as spotted knapweed can increase surface water runoff and soil erosion by 56% and 192% respectively (Lacey et al, 1989). This influences water quality in streams and rivers, and ultimately impacts productive potential of the land. Weeds have been shown to influence wildlife by reducing forage, modifying habitat structure - such as changing grassland to a forb-dominated community, or changing species interactions within the ecosystem (Belcher and Wilson 1989; Bedunah 1989; Trammell and Butler 1995; Thompson 1996). Non-native plants also threaten biological diversity of native plant communities by displacing native species (Tyser & Key 1988) and can threaten the survival of rare and sensitive plants (Lesica 1991).

The cost of spotted knapweed and leafy spurge to Montana's economy is substantial. Bioeconomic models were used to evaluate annual economic impact of these weeds on grazing land and wildland values. Total impact from spotted knapweed infestations were estimated at \$42 million per year, which could support 518 full time jobs in the state (Hirsch and Leitch 1996). If all vulnerable lands in the state were infested with spotted knapweed (34 million acres), the annual cost to Montana's livestock industry alone would be \$155 million (Bucher 1984). The impact of leafy spurge to Montana's economy was estimated at \$18.6 million per year (Leitch et.al. 1994).

The key to management of noxious weeds is early detection and control of infestations to prevent spread into non-infested areas. Road rights-of-way are high-risk areas for introduction of new weeds to the state and are a major site of spread of established noxious weeds. Therefore, management of noxious weeds along roadsides is critical to meet county, state, and national weed management objectives.

PROPOSED ACTION

Montana Department of Transportation proposes an ecological approach to weed management using integrated methods consistent with The Montana Weed Management Plan (2005) and National Invasive Species Management Plan (2001). This includes analyzing site conditions, prescribing management components to meet objectives, and identifying expected results. Weed management criteria for this plan were developed in part from detailed roadside weed management plans in Missoula and Phillips Counties. These counties represent high and low weed infestation levels respectively. Weed treatments are discussed in this document, and support and strengthen national, regional, and state directives as they apply to MDT lands.

Management of noxious weeds on state owned rights-of-way requires a comprehensive plan of action with six major components. These components are: 1) public awareness and education; 2) prevention and early detection; 3) rapid response and management; 4) restoration and rehabilitation; 5) research and new technology; and 6) inventory, monitoring, and evaluation. Management techniques utilized may include manual, mechanical, chemical, cultural, and biological methodologies.

Expected results from each component of the management plan are described below. Action items addressing each of these components are described in Chapter 5.

Public Awareness & Education: Increase public awareness of noxious weeds on roadsides and improve training for MDT employees on identification and management of state and county designated noxious weeds.

Prevention & Early Detection: Reduce establishment and stop seed production and spread of newly invading weeds on roadsides, stockpiles, and other MDT lands.

Rapid Response & Management: Implement cost-effective integrated programs to stop seed production and expansion of noxious weed infestations on roadsides.

Restoration & Rehabilitation: Decrease susceptibility of roadside rights-of-way to noxious weed invasion and establishment.

Research & New Technology: Identify, prioritize and facilitate coordination and implementation of research and new technology that will promote reduction of noxious weeds on road rights-of-way

Inventory: Accurately inventory and record locations of noxious weeds on roadsides and other MDT lands.

Monitoring: Measure effectiveness of various programs over time (management, public education, etc.) and compile data to develop effective management decisions.

Evaluation: Analyze integrated weed management program effectiveness.

Chapter 2

Overview of Invasive Plant Issues and Legislation



Chapter 2. Overview of Invasive Plant Issues & Legislation

ISSUES & LEGISLATION

Noxious weed management on state-owned roadsides in Montana must comply with existing laws and legislation. This section provides an overview of national, state, and county laws, legislation, and directives that will be incorporated into Integrated Roadside Weed Management Plans.

Federal Direction – Executive Order & National Invasive Species Management Plan

The President issued Invasive Species Executive Order 13112 on February 1999 that called on Executive Branch agencies to prevent and control introduction and spread of invasive species. The Order established the National Invasive Species Council, which is chaired by Secretaries of Agriculture, Commerce, and Interior and includes Departments of State, Treasury, Defense, Health and Human Services, Transportation, Environmental Protection Agency, and the U.S. Agency for International Development. The Order builds on the National Environmental Policy Act (NEPA) of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973 to prevent introduction of invasive species, provide for their control, and take measures to minimize economic, ecological, and human health impacts.

The National Invasive Species Council completed a National Invasive Species Management Plan in 2001. This Plan provides a blueprint for federal action (in coordination with state, local, and private programs and international cooperation) for invasive species. The Plan assigned the Federal Highway Administration's (FHWA) oversight in federally funded highway projects that include Interstate and State highways.

Federal Highway Administration's Vegetation Management Program guides State Departments of Transportation (DOT) on invasive species issues. Guidance on E.O. 13112 was issued to the states in September 1999, encouraging inventory and integrated management of roadside weeds before-and-after projects, assessment of invasive species during the NEPA process, and use of "environmentally and economically beneficial landscaping" practices¹. The FHWA continues to provide technical support to all states on this vegetation issue.

Under the Executive Order, state DOT's have new opportunities to address roadside vegetation management issues on both construction activities and maintenance programs. Through new levels of cooperation and communication with other agencies and conservation organizations at all levels, the highway programs offer a coordinated response against the introduction and spread of invasive species.

The U.S. Department of Transportation policy is to fully participate in the Administration efforts to prevent introduction and spread of invasive species by 1) pursuing appropriate authorities and funding for implementation; 2) participating on interagency committees; 3) analyzing invasive species' effects in accordance with Section 2 of the Executive Order 13112; 4) increasing coordinated research; 5) implementing, at DOT facilities and DOT-funded facilities, the Presidential memorandum on beneficial landscaping; 6) coordinating with international organizations, such as the International Maritime Organization, the International Civil Aviation Organization, and the International Organization for Standardizations on cooperative efforts; 7) training agency personnel and informing the public; 8) coordinating with other federal agencies and with state, local and tribal governments; and 9) encouraging innovative designs for transportation equipment and systems.

¹ Environmentally and Economically Beneficial Landscaping Guidelines include compliance with NEPA; use of regionally native plants for landscaping; design, use, or promote construction practices that minimize adverse impacts on the natural habitat; seek to prevent pollution; implement water and energy efficient landscape practices; and create outdoor demonstration projects.

The Department of Transportation's efforts to prevent introduction and spread of invasive species are consistent with: (1) strategic goals of protecting the natural environment, service, and teamwork; (2) statutory mandates to protect against aquatic invasive species; (3) active participation on interagency committees such as the Federal Interagency Committee for Management of Noxious and Exotic Weeds (FICMNEW), the Native Plant Conservation Initiative (NPCI), the Interagency Ecosystem Management Task force, and the Interagency Working Group on Endangered Species; and (4) the 1994 Presidential Memorandum on Environmentally and Economically Beneficial Landscaping Practices.

State Direction – Montana Weed Laws & Management Plan

The first noxious weed legislation in Montana was passed in 1939. Since that time additional laws and rules have been enacted to strengthen weed management efforts. There are eight laws currently affecting weed management in Montana.

1. **Montana County Weed Control Act (Title 7, Chapter 22 Part 21)** provides for weed management activities at the county level.
2. **Montana Weed Control Act (Title 80, Chapter 7 Part 7)** provides for technical assistance, embargoes, and rearing and distribution of biological weed control agents (80-7-720 MCA).
3. **Montana Noxious Weed Trust Fund Act** is a grant funding program designed to encourage local cooperative weed management programs, creative research in weed control, including the development of biological control methods, and educational programs.
4. **Montana Noxious Weed Seed Free Forage Act** establishes a certification program that provides for production of weed-seed-free forage and mulch used by individuals, agencies, and private corporations on public and private lands.
5. **Montana Agricultural Seed Act** lists prohibited and restricted weed seed levels that must be maintained in state certified seed.
6. **Montana Commercial Feed Act** prohibits noxious weeds in commercial feed.
7. **Montana Environmental Policy Act** must be addressed by major state actions that have the potential for significant environmental impacts 75-1-201 1(1)(b)(iv).
8. **Montana Nursery Law** allows for inspection, certification, and embargo of all nursery stock for listed pests, including weeds.

The Montana Weed Management Plan was updated in 2005 to provide the framework and recommendations for actions to prevent introduction and manage the spread of invasive plants in Montana. The Plan was designed to incorporate existing Montana noxious weed laws and legislation, and to complement regional, national, and international strategies in the National Invasive Species Management Plan.

The Montana Weed Management Plan identifies the following needs for roadside weed management programs:

1. Continue to improve monitoring and evaluation of weed management efforts on rights-of-way.
2. Periodically review reimbursement programs to county weed districts to increase efficiency and improve administration.

3. MDT contracts will mandate that contractors contact county weed districts for reclamation requirements on roadside projects and monitor reclamation projects on a regular basis.
4. Ensure adequate funding for weed control on highway rights-of-way to meet expansion of rights-of-way in the state.

County Direction – County Weed Management Plans

County Weed Districts implement and enforce the Montana County Weed Control Act, in addition to conducting weed education and awareness programs, developing cooperative agreements, coordinating weed management activities within and among counties, and monitoring weed infestations on private and public lands. County Weed Management Plans should provide guidelines for compliance with the Montana County Weed Control Act, Title 7, Chapter 22, Sections 7-22-2101 through 7-22-2153, Montana Codes Annotated, and provides a framework for effective noxious weed management.

In compliance with 7-22-2151, MCA the Montana Department of Transportation is required by state statute to develop a noxious weed management plan and to have the plan approved by County Weed Boards as well as providing a biennial report on weed management activities.

The weed district may provide assistance to MDT in:

1. Developing integrated noxious weed management plans
2. Maintaining written agreements specifying the mutual responsibilities of the weed district and MDT for implementing an integrated noxious weed management plan.
3. Coordinating noxious weed management programs with private Cooperative Weed Management Groups and other local, state, and federal agencies.
4. Developing educational programs about noxious weeds for the agency's personnel and the general public.
5. Obtaining biological weed control agents and monitoring their establishment.

Construction Sites and Reclamation of disturbed rights-of-way (Montana Weed Management Plan)

Section 7-22-2152, of the Montana County Weed Control Act requires any person or agency disturbing vegetation by construction in the weed district to submit a revegetation plan to the Weed Board for board approval. The plan must provide for the establishment of beneficial vegetation in the disturbed area after construction is completed.

1. The MDT must allow county weed boards to review and comment on the reclamation specifications for all road construction projects that disturb ground off the driving surface. This is not intended for short term minor disturbances by MDT maintenance crews providing for safe travel, which will be covered under long-term agreements with counties.
2. Some counties now require approval of borrow sources prior to any material placement within right-of-ways, as well as power-washing of all equipment brought into construction project areas.
3. The Standard Specifications for Road and Bridge Construction provides strong direction to construction contractors to abide by the County Weed Management Act. Standard Specification 107.11.5.

Landowner Agreements

Weed districts in the state may develop an Herbicide Free Area Agreement for landowners who request that herbicides not be applied to roadside rights-of-way adjoining their property (7-22-2153 MCA). Property owners will contact the respective County Weed District to obtain an agreement approved by MDT. Persons signing this agreement must control noxious weeds on state-owned roadsides to meet management objectives (containment, total control, or eradication, etc). MDT may rescind the agreement for non-compliance with weed management criteria.

WEED LISTS & CATEGORIES

The Montana State Noxious Weed List is updated as needed and is determined by Rule of the Montana Department of Agriculture (MDA) under provisions of the Montana County Weed Control Act. Detailed information regarding noxious weed lists and categories are described in the Montana Weed Management Plan. The 27 weeds on Montana's noxious weed list are found in **Appendix A**. These 27 Montana noxious weeds are divided into three categories based on the number of acres in the state and management criteria.

In addition, weed districts may include additional noxious weeds specific to their counties (**Appendix B**). MDT will recognize management of both county and state-listed noxious weeds for management on roadsides. In most cases, state-listed noxious weeds will have priority over county-designated species. Management criteria for species will vary based on county objectives and levels of infestations in the county.

Category 1 includes 14 noxious weeds infesting about 8.1 million acres. These weeds, such as spotted knapweed and leafy spurge, are generally widespread in the state. They are well adapted to a wide range of site conditions, and render land unfit or greatly limit beneficial uses.

Category 2 includes eight noxious weeds infesting about 101,000 acres statewide. These weeds have recently been introduced into the state or are rapidly spreading from their current infestations. These weeds, such as dyers woad and tansy ragwort, are capable of rapid spread and invasion of lands. Category 2 weeds would have a high priority for management on roadsides.

Category 3 includes five noxious weeds; yellow starthistle, common crupina, rush skeletonweed, Eurasian watermilfoil, and yellow flag iris. These weeds have either not been detected in the state or may be found in small, scattered, localized infestations. As of 2004, there were 200 acres of rush skeletonweed and 600 acres of yellow flag iris reported in Montana. Management criteria include public awareness and education, early detection and immediate action to eradicate infestations.

Chapter 3

Existing Situation and Current Program



Chapter 3. Existing Situation & Current Program

EXISTING SITUATION

Affected Area

Montana Department of Transportation (MDT) maintains about 12,000 miles of centerline road through five District and five Area Offices. This includes 1191 miles of Interstate, 5479 miles of National and Primary Highway, and 4103 miles of Secondary Highway (including Urban and X-routes). The area encompassed by rights-of-way is estimated at about 155,683 acres (*Appendix C*). Road construction activities, such as widening and straightening existing highways, add about 300 to 500 acres of new right-of-way per year. *Figure 1* shows the location of MDT District Offices in Montana and more detailed information on District Offices is shown in *Appendix L*.

The U.S. DOT's Federal Highway Administration (FHWA) classifies our Nation's urban and rural roadways by road function. Each function class is based on the type of service the road provides to the motoring public, and the designation is used for data and planning purposes. The amount of mobility and land access offered by these road types differs greatly. For the purpose of this Plan, FHWA's road function classes are discussed as (1) Interstate, (2) Primary Highway, and (3) Secondary/Frontage Roads. Each road type is defined below in terms of mileage, right-of-way characteristics, and typical management and maintenance activities. *Appendix D* shows a diagram of each road type and associated right-of-way.

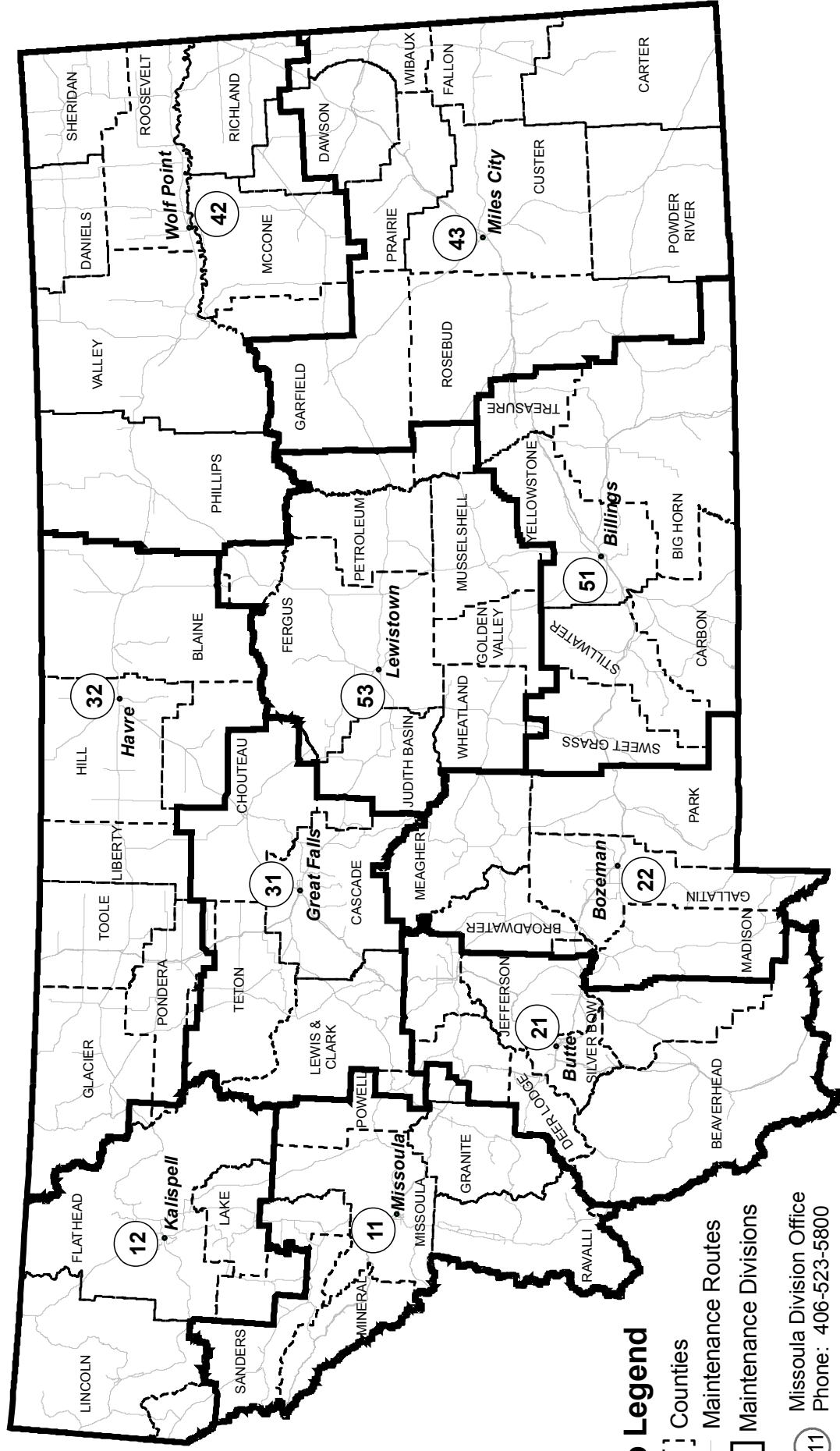
The Interstate System is the highest classification of roadways in the United States. These arterial roads provide highest level of mobility and speeds over the longest uninterrupted distance. Interstates nationwide usually have posted speeds between 55 and 75 miles per hour. Typical distance from rights-of-way fenceline to fenceline on Interstate roadways is 260 feet, with 80 feet of road surface, and 180 feet of non-roadway (21.8 acres per centerline mile). Maintenance of Interstate rights-of-way may include mowing fenceline to fenceline (when appropriate), cutting trees and brush, cleaning ditches, and periodically blading shoulders where material build up prevents drainage off of the road.

Primary Highways include major roads that connect local roads and streets with Interstate. These roads provide less mobility than Interstate at lower speeds and for shorter distances, and balance mobility with land access. The posted speed limit on collectors is usually between 35 and 70 mi/hr. Typical total width of a Primary Highway right-of-way is 160 feet, with 32 feet of road surface and 128 feet of non-roadway (15.52 acres per centerline mile). Maintenance activities on Primary Highway right-of-way are similar to those performed on Interstate ROW. However, Primary and Secondary Highways may require more tree and brush cutting, rock removal, and ditch cleaning than Interstates to maintain roadside safety and function.

Secondary Highways and Frontage Roads include minor roads that connect local roads and streets with Interstate and provide access between an Interstate and an airport, public transportation facility, or other inter-modal transportation facility. Total width of Secondary Highway and frontage road rights-of-way is 120 feet with 28 feet of road surface and 92 feet of non-roadway (11.15 acres per centerline mile). Maintenance of secondary and frontage rights-of-way is similar to that of Primary Highways.

Stockpiles, facilities, and structures associated with public safety, road construction, and maintenance are also owned and/or managed by MDT. Management of weeds on stockpiles is a concern throughout Montana. Stockpiles may be short lived or last for a number of years depending on use. For example, winter abrasives (sanding materials) are typically crushed to provide a three-year supply, however an all-

MONTANA MAINTENANCE DIVISIONS



Map Legend

Counties

Maintenance Routes

Maintenance Divisions

11 Missoula Division Office
Phone: 406-523-5800

12 Kalispell Division Office
Phone: 406-751-2000

21 Butte Division Office
Phone: 406-494-9600

22 Bozeman Division Office
Phone: 406-556-4700

31 Great Falls Division Office
Phone: 406-454-5800

32 Havre Division Office
Phone: 406-262-5500

42 Wolf Point Division Office
Phone: 406-653-6700

43 Miles City Division Office
Phone: 406-233-3600

51 Billings Division Office
Phone: 406-252-4138

53 Lewistown Division Office
Phone: 406-538-1300

purpose gradation for road shoulders or approaches can last much longer than three (3) years. The content of the stockpile, configuration, and age will have an affect on how weeds populate the stockpile. Facilities include rest areas and equipment yards, which are susceptible to weed invasion. Structures include buildings, fences, guardrails, signposts and other permanent fixtures owned and/or managed by MDT.

Weed Species, Location, and Acreage

Weed lists and categories are described in Chapter 2 and shown in *Appendix A* and *B*. Roadside acreage infested by noxious weeds varies throughout Montana and is influenced by infestation levels on adjacent lands and road type. Noxious weed infestations are more extensive in western Montana than in the eastern half of the state. For example, noxious weeds occur on about 90% of state-owned rights-of-way in Missoula County. In Lewis and Clark County, application records indicate that an average of about 20% of Interstate, 11% of Primary, and 12% of Secondary road rights-of-way are infested by noxious weeds. Phillips County, in northeastern Montana, has relatively low populations of noxious weeds, with about 2% of roadsides infested. Category 1 noxious weeds infest the greatest acreage on roadsides and other MDT lands.

CURRENT PROGRAM

Public Awareness and Education

MDT Maintenance is actively training employees in Montana to recognize new invaders in Categories 2 and 3. In addition, MDT financially supports the Statewide Public Education and Awareness Campaign.

Inventory

A statewide inventory (*Appendix E*) specific to road rights-of-way was developed in cooperation with Montana Department of Agriculture, Montana State University, county weed districts, and the Noxious Weed Survey and Mapping System Program. The inventory includes information regarding weed species and cover by route and milepost. As of the date of this report, 48 counties have been inventoried and a total of about 10,000 miles (27 counties submitted weed inventory and an additional 21 counties were inventoried by internal employees).

Management

Weed management priorities on state roadsides are currently based on management objectives established by county weed districts and the Montana Weed Management Plan. Herbicides, manual and mechanical methods, and biocontrol agents are primary methods used to manage noxious weed populations along roadways. Although mowing and cutting are important components of Montana Department of Transportation for road safety and vegetation maintenance, it often does not complement county weed management objectives or activities.

In most counties, Montana Department of Transportation contracts noxious weed management on roadsides. Mowing operations for safety, road function, and to a limited extent noxious weed control, are conducted by MDT. The Department may also maintain urban interchanges and some maintenance yards and associated facilities.

Guardrails, delineator [reflector] posts, sign posts, and bridge ends are currently managed for total elimination of vegetation to maintain visibility of structures, facilitate drainage and/or lessen snow drifting. Top-soiling and seeding are conducted following construction based on contract specification and site conditions. Management of these areas involves application of soil-residual, non-selective herbicides, either yearly or at appropriate intervals by MDT maintenance crews in an attempt to maintain vegetation-free conditions.

Facilities such as maintenance yards, stockpile areas, and rest areas are also managed by MDT. Total vegetation control is practiced in stockpile areas and maintenance yards. Rest areas are intensively managed for public use including maintenance of trees, shrubs, and mowed turf. Borrow locations owned by MDT, are referred to as "pit run" or aggregate source areas. Treatment of these areas for noxious weeds is currently on an as-needed basis.

Equipment is available for vegetation maintenance within MDT. These include mowers, hand tools, and herbicide application equipment (backpack sprayers, and truck-mounted sprayers).

Forage Permits

Some districts in Montana issue forage permits that allow harvest of grass along road rights-of-way. These permits will not interfere or take preference over management of noxious weeds on state-maintained rights-of-way

Utility Easements

Montana Department of Transportation Guidelines (September 1995) details weed management responsibility for installation of utilities on state maintained rights-of-way. MDT District office must approve herbicides to control undesirable plants. The utility company must reseed any disturbed ground with approved seed recommended by the appropriate county extension office. The utility is required to control noxious weeds for two years from date of installation.

Contracted Noxious Weed Control

Weeds along roads, highways and other MDT facilities and lands are usually managed through contracts with County Weed Districts (CWD). However, in about 20% of counties, the weed coordinator contacts prospective contractors, and selects the lowest bid contractor(s) through a competitive bid process. The County Weed Districts develop specifications for herbicide application along MDT rights-of-way.

Biological Control

The Montana Department of Transportation and some County Weed Boards work cooperatively with the U.S. Agricultural Research Service (ARS), Animal Plant Health Protection Service, Montana Weed Control Association, Team Leafy Spurge, and Montana State University to establish biological control agents (insects and pathogens). These efforts will be continued and expanded as agents that fit roadside situations become available. Five counties in western Montana have released insects targeting spotted knapweed in Zone 2 portions of the rights-of-way. Also, there are seven high schools partially funded by MDT to develop insectaries for release on MDT properties. There are distinct educational benefits provided by this relationship, and MDT is encouraging counties to identify appropriate areas in Zone 2 for insect releases. Funding for this effort is out of the Maintenance Division Headquarters in Helena.

Expenditures for Weed Management Activities

Total expenditure for weed control increased from \$948,186 in 2001 to \$1,017,159 in 2002. There was a budget increase in FY 2006 to \$1,300,000. Table 3-1 shows distribution of funds from 2004 through FY 2006 for ten (10) MDT maintenance divisions.

Table 3-1. Distribution of Noxious Weed Control Funds from FY 2004 through 2006

Division	FY 2006 Proposed Distribution	FY 2005 Distribution	FY 2004 Distribution
11. Missoula	\$140,000	\$120,811	\$115,811
12. Kalispell	\$145,000	\$143,949	\$143,949
21. Butte	\$197,000	\$186,504	\$186,504
22. Bozeman	\$133,500	\$118,180	\$117,180
31. Great Falls	\$149,000	\$149,256	\$149,256
32. Havre	\$80,000	\$60,000	\$60,000
42. Wolf Point	\$35,000	\$31,336	\$31,336
43. Miles City	\$52,000	\$45,445	\$45,445
51. Billings	\$120,000	\$113,968	\$113,968
53. Lewistown	\$75,000	\$69,006	\$69,006
Sub total	\$1,126,500	\$1,038,455	\$1,032,455
Headquarters			
Awareness/Education/TAP	\$30,000	\$15,000	\$17,993
Inventory ²	See footnote	\$24,000	\$24,000,
Contract costs	\$3000		
HQ facilities	\$1000	\$1,000	\$2,500
Research/Biocontrol	\$35,000		
Traffic control signs	\$9,000		
Restoration/demo	\$3,000		
Equipment (sprayers)	\$56,000		
Supplies	\$25,000		
Total allocated	\$1,288,500	\$1,079,955	\$1,073,955
Total Available	\$1,300,000	\$1,074,226	\$1,074,226

² Funding for inventory in FY 2006 totaled \$80,000 out of general maintenance fund.

Chapter 4

Management Methods and Practices



Chapter 4. Management Methods and Practices

Montana Department of Transportation will implement an integrated approach for managing noxious weeds on state owned rights-of-way. The MDT recognizes that roadsides may support plant species of special concern, including rare or imperiled species and medicinal plants important to Tribal entities. The Department will work with appropriate agencies and implement management methods consistent with protecting known species of special concern. Various components of an integrated management program are described in this chapter. Time and resources dedicated to each component will be determined based on state and county objectives.

INTEGRATED WEED MANAGEMENT

Integrated Weed Management (IWM) is an ecological approach to managing weeds by combining manual and mechanical tools, biological agents, cultural methods, and herbicides in a way that enhances weed control and minimizes economic, health, and environmental risks. Additional components of integrated weed management include public education and prevention. Each component may be used separately or combined with other methods to implement a more effective management strategy depending on weed and site conditions. The following section describes various invasive plant management tools that will be considered part of an IWM approach for MDT highway rights-of-way in Montana.

PUBLIC AWARENESS & EDUCATION

Early detection and treatment of weeds, and an overall effective preventive weed management program is dependent on education. County Weed Districts, federal agencies, Montana State University Cooperative Extension Service (CES), University of Montana, Montana Department of Agriculture (MDA), Montana Statewide Noxious Weed Awareness and Education Campaign, and the Montana Weed Control Association (MWCA), have been actively involved in educating the public about invasive plants.

There is a critical need for training of MDT employees on noxious weed identification and management. In addition, education and awareness efforts should be expanded to include invasive plant management on transportation corridors. Montana State University CES, Montana Department of Agriculture, and county weed districts have expressed willingness to assist MDT employees with training. MDT will contact county weed districts and CES to assist with employee training and help forge common goals and understanding to ensure future communication. MDT Maintenance will actively train employees to recognize new invaders in Categories 2 and 3.

PREVENTION & EARLY DETECTION

Transportation corridors serve as major sites for introduction and spread of noxious weeds. Thus, prevention, early detection of newly invading species, and implementing rapid control measures are critical to supporting county and state weed management objectives. Preventing the introduction of invasive plant seeds and vegetative parts into non-infested sites is the most practical and cost-effective weed management method. Measures include use of weed seed free seed, mulch, straw, and topsoil on construction projects; cleaning construction, maintenance, and rehabilitation equipment before moving it to non-infested areas; reseeding after disturbance; maintaining healthy, weed resistant roadside plant communities; not allowing newly established weeds to set seed; and eradication of newly established infestations.

Inventory of existing roadsides should be conducted prior to major construction projects to ensure that invasive undesirable plants are not transported during construction/reconstruction projects. Restoration

following roadside construction or other major disturbance is critical for preventing weed invasion. Stockpiling the organic layer and topsoil for redistribution following construction will improve establishment of desirable vegetation. Desirable vegetation that resists weed invasion should be established as soon as practicable from the road edge to the ROW boundary. Construction sites should be monitored for a minimum of three (3) years, and newly invading weeds controlled prior to seed set. Federal funds are available for this effort through a bid process. The availability of these federal funds is tied to the recovery of beneficial vegetation as described in the Stream Water Pollution Prevention Permit (SWPPP) associated with the project.

Motorized vehicles have been identified as a major distributor of invasive plant seeds. Preventing establishment of weeds on roadsides where they can be moved by vehicles is critical. Weeds should be controlled in maintenance and equipment yards, parking areas, road turnouts, and other areas frequented by vehicles to prevent movement of seed to non-infested sites. Gravel pits and other sources of construction materials should have weed management programs in place to control noxious weeds or consider a quarantine of heavily infested sites to avoid seed transport.

Equipment used in mowing, brush cutting, and other routine maintenance activities on MDT rights-of-way will be cleaned on a regular basis. A mower can be a virtual weed seeder when mowing through an infested area. Each mower should be cleaned by power washing prior to transferring the mower between Sections, when moving between Counties, or when moving from one route segment to another if a route segment has known weed populations.

Prevention programs include training employees on invasive plant identification, impacts of invasive species, and management methods. Field employees including MDT engineers, biologists, maintenance and other staff involved in road construction and maintenance activities should receive training. Maintenance employees should also know locations of weed infestations to minimize spread during routine maintenance activities. The Transportation Awareness Program (TAP) should include brochures about noxious weeds and include noxious weeds in presentations to the public.

MANAGEMENT

Manual and Mechanical Methods

Manual and mechanical techniques, such as pulling or cutting, may be used to control some noxious weeds on roadsides especially if populations are relatively small. These techniques can be extremely specific, minimizing impacts to desirable plants and animals, but they are generally labor intensive unless combined with other maintenance activities. Treatments must often be repeated annually, or several times per year to prevent invasive plants from producing seed or re-establishing. Repetitive treatments from laborers and machines may severely trample desirable vegetation and disturb soil, providing conditions for re-invasion by the same or other invasive species. When using manual and mechanical methods, it is especially important to thoroughly clean and inspect all equipment and clothing before moving it off-site. This will lessen the probability of spreading weeds to the next worksite.

Hand Pulling

Hand pulling may be a good alternative on sites where herbicides or other methods cannot be used. Pulling or uprooting plants can be effective on annuals and tap-rooted plants are particularly susceptible to control by hand-pulling. Pulling is generally not effective against many perennial weeds such, as leafy spurge, since deep underground stems and roots can re-sprout. In most cases, pulling will not be used as a management method on rights-of-way due to safety concerns. However, hand pulling may be used on stockpiles and maintenance yards for removal of individual species.

Many small infestations of newly invading weed species have effectively been managed by hand pulling or a combination of hand pulling and herbicide treatments. Advantages of hand pulling include a small

ecological impact, minimal impacts to neighboring plants, and low cost for equipment or supplies. Pulling is extremely labor intensive, however, and is effective only for relatively small, newly established infestations, even when abundant volunteer labor is available. If volunteer labor is not available, pulling costs for dense infestations of tap-rooted weeds such as spotted knapweed are about \$7000 per acre per year (Brown et al. 1999).

Mowing and Cutting

Mowing and cutting are important components of Montana Department of Transportation roadside vegetation maintenance, and can be modified to enhance invasive plant control. Mowing and cutting can reduce seed production and restrict weed growth, especially in annuals cut before they flower and set seed (Hanson 1996). Timing of mowing is critical to achieve maximum impact on invasive plants, and minimize impacts to desirable vegetation. For example, spotted knapweed (*Centaurea maculosa*) seed production can be significantly reduced by a single mowing at late bud to early bloom growth stage (Watson and Renney 1974.). If mowed earlier, beneficial plants are negatively impacted and spotted knapweed is able to re-sprout and may produce more seed than non-mowed plants. Mowing of spotted knapweed for three consecutive years may reduce adult knapweed density.

Montana Department of Transportation has traditionally mowed roadsides based on aesthetics or a timetable rather than to meet specific management objectives. Mowing should be performed only when necessary, and as part of a roadside management plan.

Mowing guidelines, to enhance desirable vegetation and impact undesirable plants, were revised in 2005 (**Appendix F**). Mowing after grasses reach dormancy (usually after July 15) will encourage development of healthy, low maintenance, self-sustaining roadsides. If mowing is required during the growing season, reduce plant shock and root dieback by avoiding mowing shorter than six (6) inches. Mowing roadside vegetation too short (scalping) during the growing season can increase soil temperature and erosion, and reduce vigor and tolerance of desirable species making sites more susceptible to noxious weed invasion. When possible, mowing should be timed to support county noxious weed control plans, and forage removal/haying operations.

Roadsides are comprised of an active zone, which is typically the area from the paved shoulder out 15 feet, and a passive zone, which is the remainder of the right-of-way width. Mowing widths in the active zone may be limited to no more than 8 to 10 feet off the edge of pavement in identified wetlands, unless needed to maintain proper functioning of highway features (e.g. drainage or snow drift control). The passive zone should not be mowed unless it is a component of a predetermined management issue, such as snow drifting areas, sight distance, aesthetic issues in urban areas, or a component of weed control plans.

Mulching and Mats

Mulching as a weed management tool can be used on relatively small areas, but will also stunt or stop growth of desirable native species. Mulching cannot control most rhizomatous perennial weeds because extensive carbohydrate reserves allow them to grow through or around the mulch. Mulching as a ground cover to reduce erosion and enhance seedling establishment is discussed under Restoration and in **Appendix H**. Mats that provide total elimination of vegetation can be utilized near structures and facilities. At the time of this printing, weed control mats are being installed on an experimental basis around several structures.

Tilling

Tilling, or other forms of turning soil, is often used for weed control in agricultural crops. Its use on roadsides is largely limited to restoration sites where soils are disturbed during construction or maintenance activities. Tilling is effective against annuals and tap-rooted perennials. Small fragments of some species, particularly perennials with rhizomes such as leafy spurge or Dalmatian toadflax, can

resprout following tillage. Best control is achieved when soils are dry, so that remaining plant fragments do not have moisture necessary to survive and re-grow. Tillage should be combined with other restoration tools such as mulching, reseeding desirable species, and possibly herbicide treatments until desirable vegetation is established on the site.

Cultural Methods

Cultural weed management methods enhance growth of desired vegetation that should help slow weed invasion. The use of irrigation, fertilization, plant competition, smother crops, and weed life cycle disruption are methods that can be utilized on roadside rehabilitation projects. Maintaining native or desirable vegetation in a healthy condition and minimizing soil disturbance are beneficial for slowing spread of noxious weeds.

Irrigation can be used to manage some weeds; however, its application on most highway rights-of-way is limited. Irrigation can be used to help establish vigorous stands of desirable plants quickly and encourage root development thus providing increased competition for invasive plants.

Use of fertilizer as a weed management tool will cause most noxious weeds to become more vigorous. Fertilizer in combination with reseeding or other restoration techniques may increase vigor of desirable plants and make the site more resistant to weed invasion.

Fire is a natural process that can help maintain or improve health and productivity of native plant communities. However, fire may also open niches that enhance establishment of invasive non-native plants, and is not a safe or practical roadside vegetation management tool that will be considered by MDT.

Biological Management

Use of biological agents for managing noxious weeds is part of MDT's integrated weed management program, and will be coordinated through county weed districts, universities, and other state and federal agencies. MDT is encouraging counties to identify appropriate areas in Zone 2 for insect releases. Funding for this activity and for insectaries at selected high schools is being offered through a memo of understanding that insects raised will be released on appropriate roadsides or facilities.

Biocontrol involves the use of living organisms, such as insects, pathogens, or grazing animals, to recreate a balance of plant species with predators. This tool is often viewed as a progressive and environmentally friendly way to control pest organisms. When successful, it can provide essentially permanent, widespread control with a very favorable cost-benefit ratio.

Biocontrol agents are introduced from the country where the host weed originated. These agents are extensively tested to ensure that they have a very narrow host range, and will not pose a serious threat to non-target plants, especially endangered species. The testing process for a biocontrol agent is typically three to four years in duration and involves 50 to 75 test plant species with final approval by USDA, Animal Plant Health Inspection Service. Although extensive screening and testing reduces the potential for injury to native plants, biocontrol is not risk-free (Story pers. comm.). Once established, biocontrol agents may persist "forever" which is liability if the agent attacks desirable species (Pemberton 1985; Lockwood 1993, 2000; McEvoy and Coombs 2000). *Aphthona* sp. is an example of a well established biocontrol agent that is impacting leafy spurge in Montana with no apparent damage to non-target plants.

At the time of this printing, MDT Maintenance is funding the release of insects to control spotted knapweed in 5 counties in the western part of the state. In addition, funding is made available to seven high schools to develop insectaries to raise and release insects in appropriate locations of the Zone 2 rights-of-way. Memorandums of understanding have been drawn up between the schools and MDT. The

long term benefits of this relationship are; awareness, education of students and the balance of bio-control for rights of way and adjacent lands.

Use of grazing animals will not be a considered weed management tool on state-owned roadsides. High cost of fencing livestock, and liability issues associated with potential livestock incursions with automobiles, restrict use as a roadside vegetation management option.

Organic Herbicides

Organic herbicides include vinegar, teas made from straw, knapweed and other allelopathic plants. Researchers at the University of Montana have documented herbicidal actions of a chemical in knapweed. However there has been little documented research on the other organic herbicides. From observations, the effect of these products tends to be non-specific, suppressing plant growth and affecting native grasses and forbs. They may be more effective on annual plants.

Herbicide Management

Herbicides are a valuable tool for managing invasive plants on transportation corridors and an important component of an integrated management program. As with other management tools, MDT recognizes the affects and limitations of herbicides proposed for use on roadsides. Guidelines for herbicide use are shown in Appendix G and I.

Herbicides are categorized as selective or non-selective based on their ability to control certain kinds of plants. Selective herbicides will control either broadleaf or grass plants depending on the product selected. For example, 2,4-D and picloram (Tordon 22K) are selective herbicides that will control certain broadleaf plants such as knapweed, and have only minimal to no impact on grasses at recommended application rates. An example of a non-selective herbicide is glyphosate (Roundup) affecting both grasses and broadleaf plants. Herbicides are also selective based on the rate used. Spotted knapweed generally is controlled using a lower herbicide application rate (1 pint of Tordon 22K per acre) than for leafy spurge (2 quarts of Tordon 22K per acre). Application rate will affect potential impact on non-target broadleaf species. At 1 pint per acres Tordon 22K is selective for weeds such as spotted knapweed and sulfur cinquefoil while many native broadleaf plants are not injured.

Herbicides currently used for noxious weed control on roadsides include picloram (Tordon 22K), aminopyralid (Milestone), dicamba, 2,4-D, MCPA, fluroxypyr (Vista), clopyralid (Transline/Redeem), triclopyr (Garlon/Redeem), metsulfuron, imazapic (Plateau), chlorsulfuron (Telar), imazapyr (Arsenal), and glyphosate. Other herbicides will be considered for use as they become available. In addition to the active ingredients which are shown prior to each herbicide name, herbicide formulations also include inert materials, such as carriers and surfactants. ***Appendix I indicates*** herbicides and rates that will be utilized for control of some noxious weeds. Tebuthiuron (Spike), sulfmeturon (Oust), diuron, and bromacil may be used on a very limited basis for functional and safety aspects along roadsides where more long-term, total vegetation control is desired. Herbicide resistance has been known to occur in some weed species such as kochia. Proper selection of herbicides and varying the family of herbicide applied to a site will reduce the opportunity for resistance to occur. For example, if metsulfuron is applied for control of kochia along a roadside, the following year fluroxypyr, dicamba or 2,4-D should be used on that site.

Properly used, herbicides are effective against most invasive plants. Variation in effectiveness occurs due to weed biology, plant growth stage, application rates, condition of the application equipment, and environmental conditions such as temperature, soil moisture, and precipitation.

Herbicides proposed for use on roadsides have been registered for use by EPA. These herbicides are carefully tested by the manufacturer to determine human health, safety, and environmental effects prior to

registration. Herbicide application made to road rights-of-way will be made within label directions by state certified herbicide applicators.

MDT Maintenance Division has licensed applicators that apply herbicides for noxious weed management on rights-of-way. Although most herbicide applications are currently contracted through county weed districts, MDT has assumed responsibility for weed control on some rights-of-way. Weed management activities, including herbicide applications, would be coordinated with respective county weed districts to help assure correct application method, timing, and noxious weed species and location.

RESTORATION & REHABILITATION

Restoration is a critical component of roadside invasive plant management programs. Healthy plant communities are more resistant to weed invasion. Restoration of roadside plant communities will ultimately reduce costs associated with invasive plant management and reduce maintenance costs from mowing.

Both desirable native and non-native species will be considered in reseeding disturbed sites. Choice of species will be based on objectives for the site, environmental conditions, species biology, ease of establishment, and resistance to weed invasion. Road shoulders are a critical area for developing plant communities that resist weed invasion. Seeding objectives and requirements may vary between the road shoulder and those areas located beyond 15 to 20 feet from the road edge. Seeding considerations are shown in *Appendix J*.

Seeding methods should be consistent with site conditions and seeding rates adequate to fill as many niches as possible. Low growing grasses have been shown to slow weed invasion and are well suited to roadsides. These species should be planted from the edge of the pavement to at least 15 feet. Taller species that are resistant to weed invasion may be seeded beyond the road shoulder where they do not impact road safety.

Mulching generally can improve overall germination and seedling establishment, and protect the soil resource. Certified weed-seed-free straw or native hay can be placed on the site by hand, choppers, or with a blower for large areas. Straw mulch often needs to be anchored to prevent being blown or washed away by overland water flow. The use of tackifiers, plastic, or biodegradable netting is an effective way to retain the straw on the site. Mechanical crimpers have also been used to push the straw into the soil surface on sites where the use of heavy equipment is feasible. Hydro-mulching and use of pre-made erosion control mats may be necessary on steep sites or those with high erosion potential.

Construction projects save topsoil that is replaced after construction activities are complete. Construction of slopes of 2:1 or greater should be avoided whenever possible. If steep slopes are unavoidable, mats or similar ground-cover materials will be utilized to establish vegetation. Vegetation will be established from the road edge to the ROW boundary where possible.

INVENTORY, MONITORING & EVALUATION

Inventory, monitoring, and evaluation are critical components of a roadside vegetation management plan. Inventory of existing weed infestations is necessary to identify newly invading species, develop long-term management goals and objectives, implement action plans, and evaluate the status of weed management efforts. Monitoring and evaluation are necessary to establish baseline data on site condition and record changes in vegetation trends before and after implementing weed management practices. Evaluation relates information obtained from monitoring to the objectives of the annual plan of operation.

Inventories provide information on weed biology and ecology; help predict high-risk sites for weed invasion, direct management decisions; and raise public awareness. Historic inventory data indicates that

roadsides are high-risk sites for weed invasion, and should be inventoried periodically to support prevention, early detection, and rapid response programs. Inventory standards are provided in the Montana Noxious Weed Survey and Mapping System and International Mapping Standards. MDT developed an inventory process for roadsides in 2003 (*Appendix E*) that will be implemented statewide on roadsides.

Monitoring and evaluation efforts should be implemented to measure status of projects. Monitoring efforts should be both short and long-term depending on project objectives. The level of monitoring will vary based on resources and manpower available. Monitoring includes all aspects of the integrated program including public education and awareness, prevention, restoration projects, and roadside weed management.

Chapter 5

Plan of Action



Chapter 5. Plan of Action – Integrated Roadside Management Strategies

The magnitude of noxious weed infestations on roadsides in Montana requires a comprehensive plan of action that includes six major components. These components are: 1) public awareness and education; 2) prevention and early detection; 3) rapid response to control new introductions, and implementation of integrated management methods for species that are widely established; 4) restoration and rehabilitation; 5) research and new technology; and 6) inventory weed populations, and monitor and evaluate program results to measure progress towards expected results. The noxious weed management strategy will be compatible with Montana's overall weed management plan.

The Department of Transportation in cooperation with county, state, and federal entities will implement an integrated approach for managing weeds on roadsides in Montana. Management actions are based upon principles and practices consistent with current science, and will incorporate prevention, early detection and rapid response, control, and restoration strategies to meet management objectives. Action items for each component of the Integrated Roadside Weed Management Program will be addressed in this chapter of the plan.

LEADERSHIP

Montana Department of Transportation is committed to observing state laws regarding management of noxious weeds on state owned rights-of-way. In addition, the Department will promote proper land stewardship and strive to be a good neighbor to adjoining landowners. MDT will continue to fund a noxious weed coordinator position with statewide responsibility to work with private and public landowners, county weed districts, and other state and federal agencies regarding noxious weed management on state owned rights-of-way. Expected result of the leadership component of this plan is **to provide statewide guidance and leadership in coordinating activities between private, state, and federal entities regarding noxious weed management on state-owned rights-of-way.**

ACTION ITEMS	RESPONSIBLE ENTITY
1. MDT's Noxious Weed Coordinator will ensure compliance with Montana County Weed Control Act.	MDT – weed coordinator
2. Facilitate coordination between MDT Districts and County Weed Coordinators regarding noxious weed management on roadsides.	MDT – weed coordinator; Maint. chief
3. Meet with County Weed District's at least annually to discuss and formalize funding and management priorities.	MDT –Maint. chief
4. Determine statewide management priorities and funding allocation based on the Montana Weed Management Plan and available revenue.	MDT – weed coordinator
5. Evaluate and monitor weed management activities on roadside ROW and measure compliance with MDT Roadside Weed Management Plan.	MDT – weed coordinator
6. Identify and (when needed) strive to secure additional revenue that can be utilized to enhance weed management efforts on roadside rights-of-way.	MDT – weed coordinator

7. Communicate/coordinate with MDT divisions to help ensure that construction and design features enhance desirable vegetation on roadsides thus minimizing weed establishment and spread.	MDT – weed coordinator and botanist
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PUBLIC AWARENESS & EDUCATION

Public education is a critical component of the Montana State Weed Management Plan. Expected result of the public awareness and education component is to **increase public awareness of noxious weeds on roadsides and improve training for MDT employees on identification and management of state and county designated noxious weeds.**

ACTION ITEMS	RESPONSIBLE ENTITY
1. Support Statewide Noxious Weed Awareness and Education Campaign Task Force.	MDT – weed coordinator
2. Develop demonstration areas in cooperation with county weed districts (CWD) on various weed management methods.	MDT – Maintenance chief; CWD
3. Conduct or provide training programs for MDT employees on weed identification and management.	MDT – Maintenance chief; CWD; MDA
4. Distribute noxious weed information during local and regional events via Transportation and Awareness Program (TAP).	MDT –TAP coordinator

PREVENTION & EARLY DETECTION

A comprehensive approach for preventing establishment and spread of noxious weeds on roadsides in Montana is critical to the success of this plan. Expected result of the prevention component of this plan is to **reduce establishment and stop seed production and spread of newly invading weeds on roadsides, stockpiles, and other MDT lands.**

ACTION ITEMS	RESPONSIBLE ENTITY
1. Inventory roadsides for noxious weeds every five years.	MDT – weed coordinator
2. Inventory or assess stockpiles for noxious weeds and treat as required.	MDT – weed coordinator; Maintenance chief

3. Inventory existing roadsides for noxious and invasive plants a minimum of one year prior to any major construction or reconstruction project.	MDT – weed coordinator; Maint. chief; District Const. Engineer
4. Institute a rapid response control program to stop establishment and spread of newly invading species, and eradicate infestations when possible.	MDT and CWD; contractor
5. Inform Montana Department of Agriculture (MDA), MDT, and county weed district on location of newly invading weeds (Category 2 and 3) and permanently identify sites.	MDA, MDT, CWD
6. Monitor treated sites three times annually until seed is no longer viable in soil. Ensure eradication of newly germinating weeds prior to producing seed.	MDT, CWD, MDA
7. Work in cooperation with county, state, and federal entities to develop best management practices (BMP's) for road construction activities.	FHWA; MDT
8. Identify roadside sites susceptible to weed invasion, such as post construction areas, and monitor sites for weed invasion.	CWD, MDT, FHWA
9. Include weed identification with Adopt a Highway program	MDT-weed coordinator

RAPID RESPONSE & MANAGEMENT

Management of roadside noxious weeds in Montana may vary based on weed species present, county objectives, road type including Interstate, Primary, and Secondary roads, and roadside “Zone”. The expected result is to **implement cost-effective integrated programs to stop seed production and expansion of noxious weed infestations on roadsides**. Management tools will be adapted to meet functional and safety requirements mandated by law, while promoting healthy, low-maintenance, weed resistant plant communities on roadsides. Backpack weed sprayers were distributed to 106 maintenance sections throughout the state with the intent of eliminating new invaders as they become evident and to manage small infestations of noxious weeds in Zone 3.

Description and function of various road types are discussed in Chapter 3, Existing Situation and Current Program. Roadside management zones are described below.

Roadside Management Zones

Zone 1 - Operational Zone: The “operational zone” includes the roadside area starting at the edge of the paved area extending to a minimum of fifteen feet (15’). This zone is highly vulnerable to invasion by weed species and will be managed to stop weed seed production. This zone is also typically mowed at least once a year to improve sight distance and aid in snow removal.

Zone 2 - Transitional Zone: The “transitional zone” includes the roadside area, starting fifteen feet (15’) from the edge of the paved area to the right-of-way line. General weed management objectives for “transitional zones” are to control weeds in areas where there are active Cooperative Weed Management Areas or where adjacent lands are relatively free of noxious weeds. Satellite noxious weed infestations will be contained and controlled.

Zone 3 - Stockpiles, Structures and Facilities: Stockpiles include materials in stockpiles in addition to stockpile sites. Structures include areas in and around guardrails, delineator [reflector] posts, sign posts, bridge ends, and stockpile areas. Facilities include maintenance yards and rest areas and other properties owned or managed by MDT. Controlling noxious weed seed production is a priority within this zone.

Roadside Management Priorities

1. Early detection and rapid control of new infestations and newly invading weed species.
2. Complete control or eradication of established priority noxious weeds occurring as satellite infestations on roadsides.
3. Restrict or minimize noxious weed seed production from pavement edge to 15 feet along the highway shoulder (Zone 1) to reduce seed movement by vehicular traffic
4. Control noxious weeds from the edge of pavement to ROW boundary in areas where adjacent lands are weed-free, support relatively low weed populations, and/or are involved in active weed management programs.
5. Expand biological management efforts on Zone 2 roadsides and/or on adjacent lands in areas where adjacent lands are infested.

New Invaders

Operational (Zone 1), Transitional (Zone 2), and Stockpiles, Structures & Facilities (Zone 3)

Early detection and rapid control of new invaders is the highest priority on roadsides and other MDT managed lands in Montana. These species are targeted for early detection and eradication regardless of road type or management zone. Species include those within Category 2 and 3 of the Montana Statewide Noxious Weed List. Counties may also classify weeds in Category 1 as “new invaders” if species are not currently present or present in only small infestations within their county.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Ensure control of established new invaders by appropriate methods to achieve complete removal of the species.	Contractor; CWD, MDT Maintenance

Established Noxious Weeds

Category 1 weeds are present in Montana in relatively large infestations. Management of these weeds will vary based on county objectives, status of weed infestations on adjoining lands, presence of Cooperative Weed Management Areas (CWMA), and roadside Zone. Control of seed production and containment of lateral spread on all satellite infestations of noxious weeds will occur within both Zone 1 and 2.

Management in Zone 1, from the edge of the paved area extending to a minimum of 15 feet, will be managed the same regardless of road type. Management of infestations in Zone 2 will vary based on weed species, size of infestation (scattered versus solid infestations), and management objectives on adjacent lands.

Zone 1: Operational Zone

ACTION ITEMS	RESPONSIBLE ENTITY
1. Control noxious weed seed production and spread of satellite weed infestations within Zone 1.	Contractor; MDT Maintenance
2. Coordinate roadside application schedule between herbicide applicators and MDT mowing operations to obtain most effective control of noxious weed seed production on roadsides.	Contractor; MDT Maintenance
3. Utilize mowing and herbicides to establish and maintain a 15 foot buffer along highway rights-of-way to reduce weed seed spread by vehicular traffic. Mowing will be prioritized based on roadside safety and vegetative characteristics.	Contractor; MDT Maintenance
4. Restore and encourage growth of desirable vegetation that resists weed invasion on disturbed sites or areas where vegetation is not well established.	MDT Maintenance

Management Methods for Zone 1

Herbicides, mowing, vigilant monitoring, and restoration methods will be used to reduce weed infestations, prevent seed production, and limit or prevent lateral spread within Zone 1 (edge of pavement to 15'). County weed districts and MDT will coordinate roadside mowing and herbicide application so that both methods compliment weed management efforts. Mowing at proper weed growth stage can reduce weed seed production and extend effectiveness of herbicide treatments. However, mowing prior to herbicide treatment may reduce visibility of noxious weeds to applicators. Herbicide use should decline as desirable vegetation improves and open niches decline in the roadside plant community. Applicators may utilize backpack sprayers and hand-lines within this zone for limited noxious weed control and treatments near structures. However, the most cost efficient method of controlling weeds in this area is by utilizing a broad-jet application of herbicide on an as-needed basis. MDT is undertaking an active program, beginning in 2006, to eliminate sweet clover and alfalfa, in addition to noxious weeds from Zone 1 portions of the right of way. This effort will improve sight distance, and may reduce deer/vehicle impacts, reduce mowing efforts, and enhance noxious weed management.

In some areas, conventional mowing alone may be used on roadsides where mowing can occur during optimal timing to impact noxious weeds. If possible, conventional mowing should be conducted after cool season grasses have produced seed and when the majority of noxious weeds are at the late bud growth stage (late June to late July). Mowing height during the growing season should not be less than six (6) inches to reduce impact to desirable species. Mowing later in the season following herbicide application is recommended only to meet safety and functional requirements of

roadsides. Hand pulling will not be utilized as a management tool within this zone because of hazards to workers, and scale and density of weed infestations.

Post-treatment monitoring will determine areas where desirable vegetation is lacking or require restoration techniques to increase resistance to weed invasion. Rehabilitation of these sites will include seeding desirable grasses such as sheep or hard fescue that resist weed invasion, have a low growth form that does not require mowing, establishes well on roadsides, and is well adapted to roadside disturbance.

Zone 2: Transitional Zone

Priorities for management of weeds in this zone may differ slightly based on county objectives, road segments, size of individual infestations, terrain, and abundance of the weed on adjacent land, or adjoining land management goals and objectives.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Control seed production, and contain spread on satellite infestations of noxious weeds within Zone 2 roadsides.	Contractor; MDT Maintenance
2. Contain and control noxious weeds along entire highway rights-of-way in areas where adjoining lands are non-infested, have scattered weed infestations, or are within active CWMA's.	Contractor; MDT Maintenance
3. Expand biocontrol efforts on widespread weed infestations in areas where adjoining lands are infested.	MDT – weed coordinator
4. Facilitate and support rearing and release of biological agents for MDT lands when adjoining lands are heavily infested by noxious weeds.	MDT – weed coordinator & maintenance
5. When possible, time mowing operations to limit and reduce seed production on roadside infestations where adjacent lands are infested.	MDT – Maintenance
6. Enhance or restore desirable vegetation that resists weed invasion on disturbed sites or areas where vegetation is not well established.	MDT – Maintenance

Management methods for Zone 2

Satellite Weed Infestations. Satellite weed infestations are widely scattered infestations of Category 1 noxious weeds, or noxious weeds that are in Category 2 or 3. Management methods for satellite weed infestations include the use of selective herbicides, restoration of disturbed sites, and herbicides in combination with other manual and mechanical methods. Methods selected should provide for complete containment and control of infestations and lead to possible eradication of isolated infestations.

ROW adjacent to non-infested sites, sites with scattered infestations, or active Cooperative Weed Management Areas (CWMA's). Management of noxious weeds along highway rights-of-way in areas

that are non-infested to lightly infested, or where there are active CWMA's is critical. Management objectives include preventing seed production and lateral spread of noxious weeds. Management tools should be consistent with those used in adjacent CWMA's and meet control objectives. Herbicides in combination with biocontrol agents, manual methods, site restoration, and/or mowing may provide effective management. Sites should be monitored and re-treated as needed. CWMA locations will be identified by county weed districts by route and milepost.

In general, conventional mowing is not recommended in this zone since it will impact desirable vegetation, is not needed to meet functional or safety requirements, and will not reduce density of most weed species. Modified mowers that also apply herbicide treatments may be considered.

Post-treatment monitoring on a regular basis will determine areas where desirable vegetation is lacking or other restoration techniques are needed to improve plant community resistance to weed invasions. Restoring a more desirable competitive plant community may be advantageous on large acreage ROW's, especially those that are not currently infested with noxious weeds.

Widespread weed infestations: Management tools for widespread weed infestations within a county will include restoration of disturbed sites, expanded rearing and release of biocontrol agents, and timely mechanical mowing to reduce seed production in appropriate areas.

Zone 3: Stockpiles, Structures & Facilities

Management of stockpiles is critical to prevent weeds from establishing and producing seeds and/or other plant propagules. Once weeds have established on stockpiles and produced seed they can easily be distributed to roadsides during maintenance or construction activities. Maintaining weed-free stockpiles is an important component of the roadside vegetation management program.

Presence of bare ground in and around structures and facilities has allowed invasion of noxious and nuisance weeds. Species such as sweetclover, kochia, and knapweeds are well established on most sites. Seeding desirable low-growing vegetation in and around structures will decrease susceptibility to invasion, decrease maintenance, and reduce damage caused by non-selective soil-residual herbicides. Vegetation barriers, such as mats, will also be considered around structures.

Noxious weeds will be controlled within facility and equipment yards, and rest areas to stop weed spread. Mechanical removal, physical barriers, or applications of non-residual herbicides will be encouraged in areas where total vegetation control is necessary.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Control undesirable vegetation with physical barriers, mechanical techniques, seeding desirable competitive vegetation, and selective herbicides depending on function of structure or facility.	MDT – Maintenance chief
2. Evaluate the need to maintain a 100% vegetation-free area around structures, and consider using foliar-applied, non-selective herbicides, such as glyphosate, for total vegetation control.	MDT – Maintenance chief
3. Establish demonstration areas to determine effect of seeding low-growing, desirable grasses in and around structures on weed establishment.	MDT – Maintenance chief; Environ. Div.

4. Eliminate unused or unusable stockpiles to prevent weed establishment.	MDT – Maintenance chief
5. Control noxious and/or nuisance weeds on stockpiles before they produce seed.	MDT – Maintenance
6. Use mechanical methods, hand pulling or non-selective short-residual herbicides to control weed infestations on stockpiles. If a long-residual, non-selective herbicide is used to control noxious weeds on stockpiles, use the lowest rate possible to prevent injury to desirable plants that could occur when materials are placed on roadsides.	MDT – Maintenance
7. Develop language in “Crushing Contracts” to give MDT control of ensuring weed-free aggregate source sites (pits) used by MDT maintenance.	MDT – weed coordinator; Maintenance chief
8. Ensure training of applicators on non-selective herbicide application techniques for total vegetation control to minimize area treated, and include training on selective herbicides for weed control. Treat only the area needed to meet road safety and function requirements.	MDT – Maintenance chief

RESTORATION & REHABILITATION

Restoration planning is an integral component of a roadside weed management program when loss or displacement of desirable species occurs. Without restoration, areas become re-infested with either the same or new weed species. Restoring disturbed roadsides is critical to slow establishment and spread of weed species. The expected result of this component is **to decrease susceptibility of roadside rights-of-way to noxious weed invasion and establishment.**

ACTION ITEMS	RESPONSIBLE ENTITY
1. Restore desirable vegetation on disturbed roadsides as soon as possible following disturbance activity.	MDT – Maintenance and Construction
2. Evaluate restoration and rehabilitation projects annually for up to three years following seeding to determine if seed establishment was successful. Restoration/rehabilitation of disturbed roadsides will not be considered completed until 70% of desirable vegetation is well established as determine by MDT guidelines.	MDT – Environmental Services

3. Work with highway design construction engineers to develop best management practices (BMP's) that facilitate establishment of desirable vegetation following construction. This includes, but is not limited to, removal and stock-piling of topsoil for replacement following construction, avoiding steep cut slopes, and consideration of certification for all borrow sites.	MDT – Environmental Services; Engineering: FHWA
4. Identify roadside sites where restoration or reseeding is needed to improve weed resistance of roadside plant communities and develop projects to restore sites.	MDT – Environmental Services
5. MDT will develop an agreement that will identify appropriate seed mixes, procedures, and desired outcome for re-establishing vegetation on sites disturbed by routine maintenance. This agreement would be on-file with county weed districts.	MDT, Maintenance; County Weed Districts

RESEARCH & NEW TECHNOLOGY

Roadsides serve as a vector for the spread of noxious weeds and are often difficult sites to establish and maintain desirable vegetation. Montana Department of Transportation recognizes the need for research and new technology for road right-of-way vegetation management that minimizes establishment of noxious weeds, facilitates safety and road function, and reduces maintenance costs. The expected result of this component is to **identify, prioritize and facilitate coordination and implementation of research and new technology that will promote a stable roadside environment to support weed resistant plant communities on rights-of-way**. Although research and development of new technology is primarily the responsibility of the state maintenance division, counties may identify and assist with research projects.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Coordinate new research and technology regarding roadside vegetation management with representatives from MDT, County Weed District, Montana Weed Control Association, landowners, and research community.	MDT - weed coordinator
2. Evaluate current restoration/rehabilitation research, and explore the need to increase funding for research related to enhancement or development of new restoration and reclamation techniques on roadsides.	MDT - weed coordinator
3. Work cooperatively with other agencies and universities on suitable species for roadside revegetation. Competitive species that are low maintenance, low growing, and will not attract big game should be considered.	MDT - weed coordinator
4. Explore use of alternative total vegetation management treatments especially around guard rails, delineator posts and other similar structures.	MDT - Maintenance and Engineering

5. Support research to optimize bio-control insect releases to maximize their effectiveness.	MDT - weed coordinator
6. Work with Montana State University to develop predictive models for new invaders.	MDT- weed coordinator; MSU
7. Evaluate effectiveness of physical barriers such as weed control mats near MDT structures (guardrails etc.).	MDT - weed coordinator

INVENTORY, MONITORING & EVALUATION

Inventory

Expected results of weed inventory are to **accurately inventory and record locations of noxious weeds on roadsides and other MDT lands**. This information is critical for identifying location and boundaries of newly invading species, developing long-term weed management goals and objectives, and used to monitor status of weed management efforts.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Promote statewide weed inventory on roadsides and input data into a database.	MDT - weed coordinator
2. Work cooperatively with universities, contractors, and county weed districts to inventory roadsides for weed infestations.	MDT - weed coordinator;
3. Develop a user-accessible statewide database that would be compatible with State Inventory and Mapping System.	MDT - weed coordinator; MDA

Monitoring

The expected results of a monitoring system are **to measure effectiveness of various programs over time (management, public education, etc) and compile data to develop effective management decisions**. The following components are considered a baseline for monitoring the status of weed management program.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Monitor effectiveness of weed management methods on roadsides and other MDT owned/managed lands.	MDT - Maintenance; CWD
2. Compare changes in roadside weed inventory data over time.	MDT - weed coordinator
3. Conduct informal review of mowing and inventory practices through maintenance review process.	MDT - weed coordinator

Evaluation

Evaluation is relating information obtained from monitoring to objectives of the annual plan of operation. Evaluations will help determine if the weed management program accomplishes plan objectives, and if the annual operation plan is still desirable and realistic. Evaluation requires analyzing information gained through monitoring, including cost/benefit of various management methods, comparison of treated to non-treated areas, and projected costs of no action. A sample monitoring form is included in ***Appendix K***.

Necessary changes should be made to the plan of operation based on the following evaluation questions:

- Was the weed population eradicated or adequately suppressed?
- Was the planned procedure used, if not, why did it vary from the original plan?
- Were weed management costs equal to or less than projected costs?
- What was the effect on the target weed?
- Were there any side-effects to non-target organisms from the treatment?
- Should the treatment be repeated or modified?
- Was funding and manpower available at the appropriate time and were they adequate?
- Was personnel training adequate?

Montana Department of Transportation and County Weed Districts will use information gained from monitoring treated weed infestations to improve future weed management efforts on highway rights-of-way. This evolving, or "adaptive" management allows MDT to learn from past experiences, improve effectiveness, and reduce impacts.

ACTION ITEMS	RESPONSIBLE ENTITY
1. Review implementation of Plan action items annually or as needed.	MDT - weed coordinator; MDA
2. Evaluate effectiveness of action items in meeting Plan expected results.	MDT - weed coordinator
3. Review expected results and action items of the Plan to determine if they are realistic and desirable.	MDT - weed coordinator

Chapter 6

Plan Implementation and Budgets



Chapter 6. Plan Implementation and Budgets

BUDGETS FOR A COMPREHENSIVE WEED MANAGEMENT PROGRAM

A balanced comprehensive roadside weed management program that segments funding toward public education and awareness, prevention, early detection, management, research and new technology, and rehabilitation is vital to successfully manage weed infestations in Montana. Based on current weed acreage figures, about \$1.3 million annually will be needed from MDT Maintenance Division to support components of noxious weed management excluding restoration. Federal Highway Administration and MDT Construction Division has made an additional \$600,000 available statewide for funding restoration, rehabilitation and weed control for post construction on some highway projects. In addition to these funding sources, existing programs through MSU CES (Cooperative Extension Service) for training and public education, MDT District Offices (employee time and travel), and County Weed District (training) would cover a portion of costs. The percent of total budgets allocated to each critical component of a weed management program was based on Montana's State Weed Plan and modified to meet roadside situations in Montana. Funding sources and budget allocations for management program components and administrative costs are summarized in *Table 6-1*.

A budget increase of four percent (\$44,000) per year may be necessary to cover increased costs of management activities, potential weed spread, and addition of new road rights-of-way acres. Because of current and projected state-wide budget constraints, this plan is based on current funding allocation of \$1.3 million per year for the next six years.

Table 6-1. Proposed Budget Allocation for Weed Management Activities on MDT state owned or managed roadsides and facilities in Montana (based on FY 2006 budget)

	Approximate Budget Distribution	Statewide MDT Maintenance Division (\$)	MDT Maintenance Divisions – employee expenses (\$)	In kind- CWD & CES (\$)	Federal funds & Construction Division (\$)	Budget Total Including In- kind funds (\$)
1. Public Education/training	2%	30,000	55,000	28,000		113,000
2. Prevention/ Early Detection	7%	91,000	10,000			101,000
3. Rapid Response	14%	182,000				182,000
4. Management**	72%	932,000	140,000			1,072,000
5. Restoration ***					600,000	600,000
6. Research & New Technology	4%	55,000				55,000
7. Inventory/monitoring*	<1%	10,000	10,000			20,000
TOTAL		1,300,000	215,000	28,000	600,000	2,143,000

*Includes \$10,000 for inventory completion and monitoring activities (average/yr would be about \$10,000). Roadside inventoried every 5 yrs.

** In-kind costs of \$140,000 are for traffic control, spot spraying, and mowing. Management costs include equipment such as backpack sprayers.

*** Post-construction federal funds for vegetation management

(1) Public Education & Training. Two percent (\$30,000) of the total budget is allocated towards public education and training (Adopt a highway, state weed education program, TAP, training). In-kind services in the form of travel and salaries are provided by MDT Divisions (\$55,000), and County Weed Districts (CWD) / Cooperative Extension Service (CES)/ and MDA (\$28,000).

(2) Prevention & Early Detection. Seven percent (\$91,000) of the total budget is allocated to prevention activities described in action items. MDT employees will assist with early detection of newly invading species by reporting infestations and treating small infestations (\$10,000 as in-kind funds)

(3) Rapid Response. Estimated costs for rapid response program comprise 14% (182,000) of the total budget. Discussion about rapid response is described under Prevention and Early Detection and under Management (New Invaders) in Chapter 5.

(4) Management. Approximately 72% (\$932,000) of the total budget is allocated toward management of MDT lands. In-kind funds (\$10,000) provided by MDT Divisions for providing assistance to county weed districts for traffic control, monitoring, weed control (5 days/ 5 districts @ \$350.00/day), and \$130,000 for mowing that is primarily for noxious weed control (10% of \$1.3 million).

(5) Restoration & Rehabilitation: About \$600,000 is needed in post-construction federal funds for vegetation and roadside management. Funding for these projects is from Federal Highway Administration and MDT Construction Division.

(6) Research & New technology: Four percent (\$55,000) of the total budget is allocated towards research and new technology. Funding is generally for statewide research projects such as rearing and release of biological control agents or recycled sand projects, and dollars are not provided to counties unless specifically involved in research or demonstration project.

(7) Inventory & Monitoring. One percent (\$10,000) of the total budget is allocated towards inventory and monitoring. This cost is an average that will be spent per year and will complete the roadside inventory in FY 2006. The statewide inventory will be conducted every 5 years. Monitoring includes database management and other activities described in Action Items.

Administrative costs are not allocated through the \$1.3 million designated for noxious weed management.

IMPLEMENTATION

The key to success of MDT's Integrated Weed Management Plan is dependent on the ability of responsible entities to implement action items identified in the Plan. Chapter 5 identifies key action items within the plan and responsible entity.

EVALUATION & REVISION

Evaluation of progress on action items is critical to determine whether modifications or additions to the plan are necessary to improve facilitation and implementation. The work plan will be reviewed annually by April 1 to determine if action items are implemented, and if objectives are being met.

MDT's Integrated Weed Management Plan will be reviewed biennially by Montana Department of Transportation, Montana Department of Agriculture and other participants of the Steering Committee. Status of action items will be reviewed, updated as needed, and suggestions identified

for facilitation of the Plan. MDT will be responsible for scheduling an annual review process and implementing revisions in the Plan.

The Montana County Weed Control Act (7-22-2151) requires state agencies to complete six-year management plans. Revision of this document will be conducted every six years (2011).

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Chapter 8. Appendices

APPENDIX A. THE STATEWIDE NOXIOUS WEED LIST AND ACRES INFESTED

Noxious weed acres are based on responses from 48 counties submitting weed acres in 2000, previous inventory records for 6 counties, and no records provided for 2 counties. Acres for Category 2 and 3 weeds were adjusted in 2004 based on Task Force, weed district, or MDA recommendations.

Category 1.	Acres Infested
Canada Thistle (<i>Cirsium arvense</i>)	1,526,803
Field Bindweed (<i>Convolvulus arvensis</i>)	534,853
Whitetop or Hoary Cress (<i>Cardaria draba</i>)	83,539
Leafy Spurge (<i>Euphorbia esula</i>).....	1,200,000
Russian Knapweed (<i>Centaurea repens</i>).....	64,466
Spotted Knapweed (<i>Centaurea maculosa</i>)	3,818,450
Diffuse Knapweed (<i>Centaurea diffusa</i>)	27,523
Dalmatian Toadflax (<i>Linaria dalmatica</i>).....	204,408
St. Johnswort (<i>Hypericum perforatum</i>)	68,065
Sulfur (Erect) Cinquefoil (<i>Potentilla recta</i>)	275,542
Common tansy (<i>Tanacetum vulgare</i>).....	17,089
Ox-eye Daisy (<i>Chrysanthemum leucanthemum</i> L.).....	27,153
Houndstongue (<i>Cynoglossum officinale</i> L.)	267,665
Yellow toadflax (<i>Linaria vulgaris</i>).....	5,000
Total acres	8,120,556
 Category 2.	
Dyers Woad (<i>Isatis tinctoria</i>)	228
Purple Loosestrife or Lythrum (<i>Lythrum salicaria</i> , <i>L. virgatum</i> , and any hybrid crosses thereof)	287
Tansy Ragwort (<i>Senecio jacobea</i> L.).....	23,000
Meadow Hawkweed Complex (<i>Hieracium pratense</i> , <i>H. floribundum</i> , <i>H. piloselloides</i>)	6,508
Orange Hawkweed (<i>Hieracium aurantiacum</i> L.)	51,117
Tall Buttercup (<i>Ranunculus acris</i> L.)	2,005
Tamarisk [Saltcedar] (<i>Tamarix</i> spp.)	15,000
Perennial pepperweed (<i>Lepidium latifolium</i>).....	2,750
Total acres	100,895
 Category 3.	
Yellow Starthistle (<i>Centaurea solstitialis</i>).....	0
Common Crupina (<i>Crupina vulgaris</i>).....	0
Rush Skeletonweed (<i>Chondrilla juncea</i>)	200
Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	0
Yellow flag iris (<i>Iris pseudacoru</i>)	600

APPENDIX B. COUNTY DESIGNATED NOXIOUS WEEDS*

Species\County	BEAVERHEAD	BIG HORN	BLAINE	CARBON	CHOUTEAU	DEER LODGE	FALCON	FLATHEAD	GALLATIN	GLACIER	JUDITH BASIN	LAKE	LEWIS & CLARK	LIBERTY	LINCOLN	MADISON	MINERAL	MUSSELSHELL	PETROLEUM	PONDERA	POWELL	RAVALLI	ROSEBUD	SANDERS	SHERIDAN	SILVER BOW	STILLWATER	SWEET GRASS	TETON	VALLEY	YELLOWSTONE	Total Counties
<i>Achillea millefolium</i> (yarrow) [CAUTION]**								X							X																	1
<i>Anchusa officinalis</i> (bugloss)															X																	1
<i>Anthemis cotula</i> (dog fennel)																X																1
<i>Arctium lappa</i> , <i>A. minus</i> (burdock) [W]																X																1
<i>Arctium lappa</i> , <i>A. minus</i> (burdock)		X					X				X				X			X	X								X	X				8
<i>Artemisia absinthium</i> (absinth wormwood)				X				X							X																	3
<i>Asclepias speciosa</i> (showy milkweed)**					X									X						X						X						6
<i>Azolla mexicana (pennata)</i> (mosquito fern)											X																					1
<i>Berteroa incana</i> (hoary alyssum) [W]																X																1
<i>Butomus umbellatus</i> (flowering rush)												X																				1
<i>Campanula rapunculoides</i> (creeping bellflower)								X																								1
<i>Carduus acanthoides</i> (plumeless thistle)															X																	1
<i>Carduus nutans</i> (musk thistle)	X			X	X			X	X	X	X	X			X	X		X	X				X						X			14
<i>Carum carvi</i> (caraway)																					X					X						2
<i>Centaurea pratensis</i> (meadow knapweed)								X	X						X																	3
<i>Chaenorrhinum minus</i> (dwarf snapdragon)														X	X																	1
<i>Chorispora tenella</i> (blue mustard)											X																			X		2
<i>Cichorium intybus</i> (chicory)															X																	1
<i>Cicuta douglasii</i> (water hemlock)**																														X		1
<i>Cirsium vulgare</i> (bull thistle)																					X											1
<i>Conium maculatum</i> (poison hemlock)		X					X	X	X						X	X			X				X									8
<i>Cytisus scoparius</i> (Scot's broom)															X	X																1
<i>Dipsacus fullonum</i> (teasel)	X																													X		2
<i>Echium vulgare</i> (viper's bugloss, blueweed)															X	X	X								X							3
<i>Echium vulgare</i> (viper's bugloss, blueweed)[C]																						X										1
<i>Elaeagnus angustifolia</i> (Russian olive) [W]																																1
<i>Euphorbia</i> (some natives species)**								X																								1
<i>Glycyrrhiza lepidota</i> (wild licorice)**					X																											1
<i>Gypsophila paniculata</i> (baby's breath)			X			X		X																			X					4
<i>Gypsophila paniculata</i> (baby's breath) [C]																									X							1
<i>Hydrilla verticillata</i> (water thyme)											X																					1
<i>Hyoscyamus niger</i> (black henbane)	X	X									X					X																4
<i>Hyoscyamus niger</i> (black henbane) [C]									X																							1

*NOTE: Counties not shown do not have county-designated weeds

[C]=Considering; [W]=Watch

**Montana Native Species

APPENDIX B. COUNTY DESIGNATED NOXIOUS WEEDS*

Species\County	BEAVERHEAD	BIG HORN	BLAINE	CARBON	CHOUTEAU	DEER LODGE	FALLON	FLATHEAD	GALLATIN	GLACIER	JUDITH BASIN	LAKE	LEWIS & CLARK	LIBERTY	LINCOLN	MADISON	MINERAL	MUSSELSHELL	PETROLEUM	PONDERA	POWELL	RAVALLI	ROSEBUD	SANDERS	SHERIDAN	SILVER BOW	STILLWATER	SWEET GRASS	TETON	VALLEY	YELLOWSTONE	Total Counties	
<i>Hypochaeris radicata</i> (spotted cat's-ear)															X																	1	
<i>Iris pseudacorus</i> (yellow iris)												X																				1	
<i>Knaulia arvensis</i> (field scabious)	X															X																2	
<i>Kochia scoparia</i> (kochia)						X									X																	2	
<i>Lepidium latifolium</i> (perennial pepperweed, tall whitetop)													X																			1	
<i>Linaria vulgaris</i> (common toadflax)	X			X		X	X	X	X	X	X	X				X	X					X							X			13	
<i>Lycium halimifolium</i> (matrimony vine)																						X					X					1	
<i>Matricaria maritima</i> (pineapple weed, scentless chamomile)					X			X		X					X	X	X															5	
<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)												X																				1	
<i>Onopordum acanthium</i> (scotch thistle)				X	X										X	X			X				X									5	
<i>Polygonum cuspidatum</i> (Japanese knotweed)															X	X																1	
<i>Reseda lutea</i> (yellow mignonette)										X																						1	
<i>Rumex acetosella</i> (sheep sorrel)												X																				1	
<i>Rumex crispus</i> (curly dock)						X																										1	
<i>Salvia nemorosa</i> (woodland sage)[C]																						X										1	
<i>Silybum marianum</i> (milk thistle)				X																												1	
<i>Solidago canadensis</i> (Canada goldenrod)**													X																			1	
<i>Sonchus arvensis</i> (perennial sowthistle)					X		X							X					X	X												5	
<i>Tragopogon dubius</i> (meadow salsify)												X																				1	
<i>Tribulus terrestris</i> (puncturevine)																																X	1
<i>Verbascum thapsus</i> (mullein)	X				X					X							X	X										X				X	7
<i>Veronica chamaedrys</i> (Germander speedwell)															X																	1	
<i>Veronica officinalis</i> (common speedwell)															X																	1	
<i>Xanthium strumarium</i> (common cocklebur)																													X			1	
Total species	6	3	1	5	6	5	4	10	4	4	4	10	2	2	18	7	5	1	4	4	2	2	3	1	2	3	2	6	2	0	7		

*NOTE: Counties not shown do not have county-designated weeds

[C]=Considering; [W]=Watch

**Montana Native Species

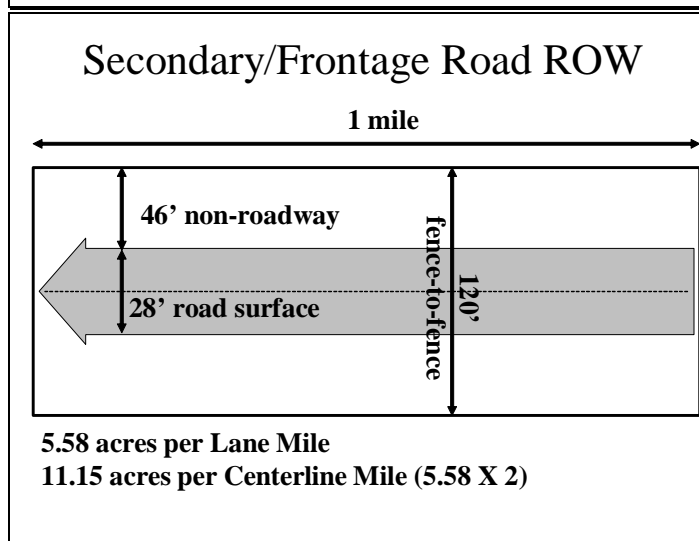
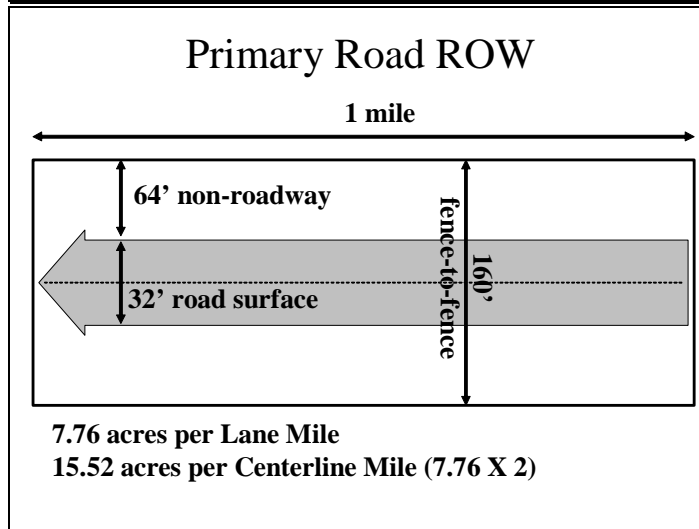
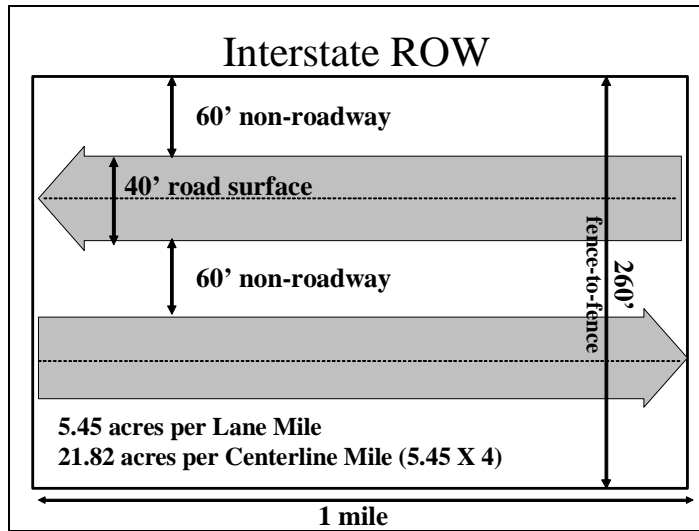
APPENDIX C. ROAD MILES AND WEED INFESTATION LEVELS BY COUNTY

***Weed acres based on county reports compiled for Montana State Weed Management Plan, 2001

COUNTY NAME	MILES BY ROAD TYPE					ACRES BY ROAD TYPE					Total Weed Acres In County	Total County Acres	% of county infested with noxious weeds ****		
	I	P	S	U	X	Total	I	P	S	U				X	Total
BEAVERHEAD	171.5	74.3	77.8		79.4	403.0						885.3	4,776.5	3,565,837	1%
BIG HORN	162.4	63.0	169.0		61.0	455.4						680.6	5,313.9	2,712,655	1%
BLAINE		93.9	87.7		0.9	182.5						10.0	2,445.0	792,837	6%
BROADWATER	11.4	81.6	39.4		1.6	134.0						17.8	1,848.3	1,319,730	6%
CARBON		153.6	23.9			177.5							2,650.8	2,142,744	2%
CARTER		50.3	26.5			76.9							1,077.2	2,427,485	6%
CASCADE	123.4	135.7	92.8	28.1	72.9	453.0						812.8	5,300.5	912,901	1%
CHOUTEAU		118.7	90.1			208.9							2,847.8	1,038,643	4%
CUSTER	85.8	121.8	35.8		28.8	272.2						321.1	3,546.4	2,784,010	5%
DANIELS		48.5	67.4			115.9							1,503.5	3,102,114	0%
DAWSON	87.4	88.5	52.5		32.2	260.6						359.0	3,270.9	1,943,478	8%
DEER LODGE	28.6	51.2	16.7		12.5	109.0						139.4	1,432.0	1,197,156	4%
FALLON		86.4	21.6		0.6	108.6						6.4	1,588.0	2,305,659	2%
FERGUS		229.8	55.4	1.3	0.3	286.8						3.8	4,187.8	1,716,828	7%
FLATHEAD		230.6	78.0		9.6	318.1						107.0	4,554.5	1,532,539	4%
GALLATIN	87.7	170.5	87.8	2.7	18.6	367.3						207.4	4,788.8	1,197,273	2%
GARFIELD		135.8	6.3			142.1							2,177.9	1,071,261	1%
GLACIER		137.9	112.6		11.7	262.3						130.5	3,526.8	3,335,437	0%
GOLDEN VALLEY		41.6	10.5			52.1							762.3	2,110,501	2%
GRANITE	57.4	37.3	25.9		57.4	178.0						640.0	2,133.5	1,115,146	2%
HILL		80.3	133.7	2.7	1.1	217.7						12.1	2,748.2	3,216,879	1%
JEFFERSON	189.2	71.5	21.6		76.1	358.4						848.5	4,263.1	1,154,874	5%
JUDITH BASIN		76.8	43.4		1.0	121.2						11.2	1,687.4	1,245,182	0%
LAKE		149.4	35.2		6.9	191.5						76.9	2,787.8	629,784	1%
LEWIS&CLARK	99.9	122.6	107.8	13.4	49.4	393.2						550.6	4,746.0	3,239,343	1%
LIBERTY		25.6	46.3			71.8							912.7	569,620	0%
LINCOLN		195.9	45.9			241.8							3,552.4	1,695,240	4%
MADISON	15.2	174.5	31.2		9.9	230.7						110.4	3,331.9	460,101	4%

***Weed acres based on county reports compiled for Montana State Weed Management Plan, 2001

APPENDIX D. ROAD RIGHTS-OF-WAY DIAGRAM



APPENDIX E. NOXIOUS WEED INVENTORY PROGRAM

For Lands Managed by The Montana Department of Transportation, updated January 2004.

Introduction

The Montana Department of Transportation (MDT) is responsible for managing approximately 160,000 acres of land across the state. The majority of this land is highway right-of-way (ROW) with additional land for stockpile sites and facilities. MDT is responsible for managing noxious weeds on these lands, just as every landowner in the state responsible for their lands. Highways are primary vectors for weed movement. Because of this, MDT takes very seriously their role in weed management, eradication, and prevention.

Program Overview

To effectively and efficiently manage noxious weeds, it is necessary for MDT to know the weed species, location, and degree of infestation for all MDT maintained lands across the state. To gather this information, MDT is instituting an annual statewide noxious weed inventory.

It is the intent of this inventory to not only provide necessary information for MDT to manage noxious weeds, but to also act as a support and resource to statewide weed mapping efforts. MDT's inventory will not replace the statewide mapping program, but be a supplement to it.

The Montana Noxious Weed Survey and Mapping System (WMS) was developed at Montana State University–Bozeman with guidance from State and Federal agencies and private individuals involved in weed management. As a WMS team member, MDT supports the goals and objectives set forth by the advisory team.

Like WMS, MDT's weed mapping inventory can be used to help us in the following ways:

- Accurately determine routes, miles and acres infested with noxious weeds
- Reference this data to help weed managers across the state calculate economic impacts and management costs
- Develop and evaluate weed management plans
- Justify and garner appropriate resources and implement effective weed management programs across Montana's state maintained highways
- Detect change in weed infestations from year to year
- Assist in developing risk assessment models
- Support public education and awareness programs

To ensure commonality with the WMS system, MDT is working closely with Jim Larson, Stillwater County weeds/GIS specialist. Jim is instrumental for ensuring quality and accuracy of data for the WMS system.

Variations from the WMS

MDT's mapping inventory system varies from the statewide system. Highway ROW is linear and is measured lengthwise in miles, and not by acreage. Consequently, our mapping efforts will be recorded by route and milepost. However, we will use the "cover classification" referenced by WMS.

A – Absent

T – Trace = about 1% coverage

L – Low = 1.1 to 5% coverage

M – Medium = 5.1 to 25% coverage

H – High = greater than 25% coverage

GPS was not chosen for this information gathering because of variables in gathering information and distribution of GPS units through the counties. Instead, a simple hard copy spread sheet with weed species across the top of the page and route and milepost on the left side of the page will be used to gather the weed inventory. (See attached samples)

Weed species present and coverage will be indicated by the appropriate letter (**A, T, L, M, H**) in the appropriate box by the person taking the inventory. If you know you have no weeds of a particular species you can put an 'A' at the top of the column with a line down through the column and of course stop the line if some other designation is needed.

The data from the hard copies will then be entered into the state road inventory system housed and maintained by MDT. Some time in the future, the inventory may be entered directly by the weed coordinator and eliminate the hard copy form. The completed inventory will also be available through the WMS system to all weed managers via the Internet. Unique queries of the system may have to be done on a case-by-case basis.

Who will take the inventory?

In 2003, MDT asked for and paid County Weed Coordinators to gather weed inventory data. Only half the counties responded. In 2005, MDT hired to short term employees from MSU to complete the inventory. At this printing, eight (8) of the 56 counties have not been completed. There are plans to complete the inventory in 2006 again with short term employees from MSU. The 2005 weed data will be used by MSU to develop a predictability model for new weed infestations on roadsides.

The County Weed Boards and Weed Coordinators have historically worked cooperatively with MDT to manage weeds on MDT land through six-year agreements. MDT has paid the county when presented with invoices for weeds treated. Payment of invoices usually require documentation by the county of where work was done, what chemicals were applied, and for what species of weeds were being treated. Through that work relationship, an inventory, of sorts, has typically been accumulating in the county and sometimes MDT. MDT has relied on the county personnel and their expertise in weed identification and treatment and we would like to continue to rely on the county for this assessment.

APPENDIX F. VEGETATION MANAGEMENT – MECHANICAL MOWING

Chapter 5.6 Vegetation Management – Mechanical Mowing (MMS 2201) 11/02/2005

Maintenance Manual Chapters 5.6 and 5.7 Available Online:

http://www.mdt.mt.gov/publications/manuals/maint_manual.shtml).

Activity Description -

This activity is the mechanical mowing of vegetation along the roadside to ensure safe, functional, and healthy roadsides through proper planning and scheduling. The default decision of the roadside manager is to NOT mow, unless the vegetation is causing a concern that needs to be addressed.

Purpose statement –

The ultimate goal of roadside vegetation management is to produce a safe and healthy, low-maintenance, self-sustaining roadside by encouraging beneficial vegetation. Proper roadside vegetation management should not necessarily be based on a timetable, but on the current vegetation type, local concerns and condition of the roadside community.

The roadside is comprised of Three Zones.

- An active zone, Zone 1, which is typically the area from the paved shoulder out 15 feet,
- A passive zone, Zone 2, which is the remainder of the right-of-way width. The Zone 2 should not be mowed unless it is a component of a predetermined management issue, such as snow drifting areas, sight distance, aesthetic issues in urban areas, or a component of weed control plans
- And Zone 3, which are the areas managed around guardrails, delineators, stockpiles and grounds associated with facilities.

Mowing may be used to:

- maintain safe sight distances,
- control noxious and nuisance weeds,
- reduce the potential for snow drifting,
- improve aesthetic values and improve the visibility of signs
- comply with local urban concerns regarding vegetation management

Timing of Maintenance –

Safety concerns take precedence over any of the other listed mowing purposes. If adequate sight distance for the traveler is limited by tall vegetation, mowing should take place regardless of other considerations. Prioritizing mowing should take into consideration the road design and how it relates to safety for the motorist. Highways, with wide paved shoulders, offer additional visibility warning and a safe place to park in an emergency and so should be mowed after roadways without these features.

Traditionally, roadsides have been mowed based on aesthetics or a timetable rather than to meet specific management objectives. Mowing should be performed only when necessary, and as part of a roadside management plan. Mowing should be limited during the growing season if possible. Fish, Wildlife and Parks (FWP) request delaying mowing because of ground nesting song and game birds that can nest on roadsides. Mowing after grasses reach dormancy (usually after July 15) will encourage the development of healthy, low maintenance, self-sustaining roadsides and satisfy the concerns of FWP. Mowing should

be timed to support and not conflict with County noxious weed control plans, and forage removal/haying operations. Some types of vegetation, such as sweet clover, can be more difficult to mow causing mowers to slow down, use more fuel and loss efficiency. Consider removing this type of vegetation with herbicides as mentioned in Chapter 5.7.

There are urban and rural considerations for mowing.

- Urban areas may have local concerns for fire, visibility and aesthetics that differ from rural considerations. Mowing height and frequency can and should be scheduled to compliment urban area goals.
- Rural rights-of-way, which is the vast majority of MDT's property, should only be mowed with the justifications listed in the Purpose Statement above. There are some rights-of-way that may not need mowing at all.

Specialized Equipment

- Mowers or brush cutters
- Truck mounted attenuator (TMA)
- Hand operated mowers and weed trimmers

Safety and Training

Supervisors should discuss safety hazards of mowing and use appropriate equipment and protective clothing. Consult MDT Employee Safety Manual and MUTCD mobile work zone requirements. Questions regarding vegetation should be addressed to the Roadside Management Specialist in the Helena Service Center.

Best management practices include:

- MDT mowing plans will identify areas and mowing timing to be supportive of the county 6-year noxious weed control plans and other considerations.
- Mowing widths in Zone 1 (15 feet from paved shoulder) may be limited in some places to no more than 8 to 10 feet off the edge of pavement. These areas may be defined by DEQ as state water quality impaired segments
- Mowing height should never be less than 6 inches unless there is a specific urban consideration. This mowing height will reduce plant shock and root dieback. The following can occur if roadside vegetation is cut too short (scalping) during the growing season.
- Soil temperatures and erosion increases
- Desirable vegetation experiences reduced vigor, lowering tolerance to drought, and vulnerability to high-maintenance noxious and nuisance weed growth.
- Mowing during the growing season opens the shade canopy and encourages weed growth
- Clean equipment used in mowing and brush cutting activities on MDT R/W on a regular basis. A mower will spread weed seeds when mowing through an infested area. Each mower should be cleaned by power washing prior to transferring the mower between Sections, when moving between Counties, or when moving from one route segment to another if a route segment has known weed populations.

Procedures

- Evaluate traffic control needs and appropriate work zone requirements.
- Refer to the Area vegetation management plans for timing, location, weed control, and vegetation development.
- Inspect areas to be mowed for debris and other hazards or obstructions. Remove debris to prevent items from becoming projectiles. Hazards and obstructions should be marked and may include culverts, concrete head-walls, flared ends, drop inlets, splash basins and washouts.
- Mowing widths should be no greater than Zone 1 unless some limited or specific problem or goal exists. It is not MDT intent to mow all of our rights-of-way.
- Check condition of equipment and complete required pre-operational inspections and daily operational servicing. Check to make sure equipment is set for appropriate mowing heights. Minimum mowing height is six inches (6"). Always mow in the same direction as traffic, unless special permission is given by the Maintenance Chief.
- Shadow vehicles should be considered to warn traffic in areas where mowing operations interfere with the normal flow of traffic in the driving lane. Consult the MUTCD for proper traffic control techniques for mobile operations.
- Particular attention should be given to visibility concerns at roadway intersections and approaches.
- Clean equipment used in mowing and brush cutting activities on MDT R/W's on a regular basis. A mower can cause weed seed distribution after mowing through an infested area and then going on to un-infested areas. Each mower should be cleaned by power washing prior to transferring the mower between Sections, when moving between Counties, or when moving from one route segment to another if a route segment has known weed populations.
- Since mowing operations often require operators to work in isolated areas, operators should take portable radios during mowing operations, if available.
- When mowing around delineators, refrain from bringing the mower onto the paved roadway, if possible. Instead, consider eliminating the vegetation between the delineator and the paved surface using herbicides as described in Chapter 5.7. Extra caution should be given to steep shoulders to prevent rollovers when mowing behind delineators.

APPENDIX G. VEGETATION MANAGEMENT – CHEMICAL VEGETATION CONTROL

Chapter 5.7 Vegetation Management – Chemical Vegetation Control–Chemical Spraying (MMS 2204)

Activity Description

This activity includes chemical treatments to control or prevent the growth of vegetation such as noxious weeds, brush or other vegetation. (See special instructions in Vegetation Management Plan.) Chemical spraying should be done by or under the supervision of a licensed chemical applicator. Chemical spraying may be a contracted service.

This activity should be considered in developing the six-year weed control agreements.

Purpose

The purpose of this activity includes the chemical control against the spread of noxious weeds, to inhibit the growth of vegetation around structures such as signs and guardrails, improve aesthetics, improve sight distance, reduce fire hazards, reduce snow drifting and to help with drainage problems in areas where mowing is not practical.

Nuisance vegetation, such as sweet clover and alfalfa, should be eliminated from Zone 1 through the use of herbicides. This vegetation causes visibility concerns as well as increased mowing efforts and can attract deer to the roadsides. The removal of this vegetation takes precedence over any concerns raised by private haying contractors.

Timing of Maintenance

There are a number of chemical vegetation control options. Each situation will require planning for the specific application and specific product used.

Chemical mowing is harmful to beneficial grasses and should not be conducted.

Chemical sterilants are primarily used around guardrails, signs, stockpiles and facilities. Chemicals are typically applied in the fall or early spring based on manufacturer's recommendations.

County weed control boards typically perform noxious weed control for the Department. However, Department noxious weed control efforts must be done under the direction of a licensed applicator.

Appropriate chemicals are used to control brush and nuisance vegetation.

Specialized Equipment

- Sprayer mounted on a truck.
- Hand sprayer
- Protective clothing including gloves, eye protection, coveralls
- Truck Mounted Attenuator (TMA) may be required.

Materials

For a chemical vegetation control program to be successful, the proper product must be used. The product must be capable of obtaining the desired control and be economical when compared to other methods of control. All products must be handled, stored and applied according to the manufacture's label.

Documentation

A record of all chemical applications must be kept on the appropriate form acquired through the licensed applicator.

Storage

Chemicals should be accessible only to authorized personnel and should be stored in accordance with MSDS standards and manufacturer's recommendations.

Safety and Training

All employees who work with chemicals should attend training established and approved for chemical applicators and be licensed as a pesticide applicator or work under the direct supervision of a licensed pesticide applicators.

The following guidelines should be observed:

- Employees must be trained prior to using a chemical product.
- On going and continued annual education is required for applicators
- Employees may only use products for which they are certified to use.
- Certification must be kept current for licensed applicators.
- Employees will follow special instruction for each chemical he/she uses including the use of protective clothing, proper disposal, use and handling.
- Employees must follow the manufacturer's directions for mixing, handling and use.
- Employees should be familiar with MSDS for specific chemicals they are using.
- Employees need to follow safety guidelines in the MDT Safety Manual.

Special Precautions

Care must be exercised in filling and washing the equipment to ensure that chemicals are not deposited in locations that will become hazardous to vegetation, water, ground water, human or animal life. Equipment should be checked before using and thoroughly cleaned after use.

Special precautions are required around water, crops, residences and areas designated as no spraying areas.

Environmental Best Management Practices

Best management practices include:

- Eliminating spray activities on structures located over streams or adjacent to wetlands.
- Using chemicals approved for use near aquatic resources whenever spraying.
- Using herbicides in accordance to EPA labels.
- Hand spray around structures over water or within riparian area that require chemical vegetation control.
- Within twenty-five (25) feet of riparian areas, boom spray no farther than eight (8) feet from the road edge.
- Within 25 feet of an active stream, stop all boom spraying unless specific herbicide permits.

Procedures

- Coordinate and efforts with the county weed coordinator to develop an annual weed control plan.
- Review project site to determine if any special application conditions exist.
- Ensure that MSDS for the products being used are on the job site.
- Check application equipment daily for safety and proper application.
- Wear protective clothing and safety devices.
- Mix chemical in accordance with manufacturer's recommendation.
- Mix dye with chemicals so applicators can determine where spraying has occurred.
- Provide necessary traffic control.
- Apply chemicals in accordance with manufacturers' recommendations.
- Use caution to minimize drift to adjoining properties. Use hand-held wind gauges to determine wind speed. Applicators should use extreme caution spraying materials when winds exceed 10 mph.
- Spray with truck sprayer when practical, hand-held sprayer on inaccessible areas or spray as identified in the weed control plan.
- Remove traffic control.
- Clean and service spray unit.
- Dispose of chemical containers according to MT Department of Agriculture's rules.

APPENDIX H. MULCHING AND EROSION CONTROL

(Taken in part from National Park Service, USDI, Revegetation and reclamation training workshop, April 1993.)

A mulch is a non-living material placed on the soil surface primarily to protect the soil from wind and water erosion, facilitate infiltration, reduce evaporation, and moderate soil temperatures. Mulching generally can improve overall germination and seedling establishment and protect the soil resource. Specific site conditions need to be examined to determine the potential effectiveness of a mulch. On shallow sites where soils are not highly erodible, soil moisture and organic matter are present, high winds are not a problem and no soil crusting is expected to occur, then mulching may not be necessary.

Straw mulches consisting of wheat, barley, and/or oats are the most common mulches. Application rates can vary, but average 2 tons per acre. Only certified weed free straw should be used to prevent introduction of noxious weeds. Stems need to be as long as possible to increase life expectancy as a mulch. Straw can be placed on the site by hand or with a blower for large areas. Straw mulch often needs to be anchored to prevent being blown away or washed away by overland water flow. The use of tackifiers, plastic, or biodegradable netting is an effective way to retain straw on the site. Mechanical crimpers have also been used to push straw into the soil surface on sites where use of heavy equipment is feasible.

Native hay mulches have also been used but often contain high levels of noxious weed seed or other non-desirable plant species. Only native hay certified noxious weed free, and contains desirable species should be used. Under these conditions, native hay can result in increased diversity of the resulting plant community.

Hydromulching with wood fiber or paper in a water slurry is another form of mulching. This requires the use of a machine called a hydromulcher or hydroseeder, and equipment access to the site. Wood fiber mulches are usually more effective than paper mulches because longer wood fibers adhere to soil and are more resistant to wind and water erosion. Hydromulch is often applied at average rates of 1,500 lbs. per acre and a tackifier can be used to help it stay on the slope. Incorporation of seed and fertilizer in the mix is not a good idea because some seed will not be in contact with the soil and can be lost to desiccation. Fertilizer in the slurry can create a high salt concentration that can reduce water adsorption and kill seed.

Woodchips, sawdust, and bark can also be used as mulch. These can be quite inexpensive if local sources are present. Wood residues are very long lasting compared to other mulches. However, nutrients like nitrogen can get tied up and immobilized in the wood during the decay process. The addition of fertilizer can help offset nitrogen deficiencies during decomposition.

The use of pre-made erosion control mats are also effective for revegetation and rehabilitation projects. These mats come in a variety of types, sizes, strengths and can be expensive. Mats made from straw and/or coconut fiber with biodegradable netting are rolled onto the site and secured with metal staples. Stronger mats, either pure coconut fiber or synthetic fibers, need to be used on sites with high erosion hazards, high velocity overland flow rates, or steep slopes.

Mulching after seeding can improve revegetation success by keeping seed in contact with soil, moderating temperatures, and reducing water loss necessary for seed to germinate. Mulching around planted seedlings can also improve water availability and provide protection from inclement environmental conditions.

Mulch Types

Type	Description	Required Equipment	Application Rate	Considerations	Cost	Life
Straw	Certified Straw	Hand Application, Blown on or Applied by Helicopter	4000 lbs./ac (4") on North slopes; 5000 lbs./ac (5") on South side	Tough to put on extremely steep slopes except by helicopter. Inexpensive, effective.	\$1000/ac by Hand; \$3000/ac by Helicopter	2 Years
Hydro Seed Wood Cellulose Mulch	Hydro Mulch w/Wood Cellulose Mulch	Applied with a Hydro Seeding Machine	2000 lbs./ac	Hydro Seeders are expensive to move in and are in short supply in the fall. Seeding cannot be kept current with construction. Very effective.	\$1000/ac by Hand; \$3000/ac by Helicopter	1 Year
Hydro Seed Paper Mulch	Hydro Mulch w/Paper Mulch	Applied with a Hydro Seeding Machine	2000 lbs./ac	Same as Above.	\$1000/ac plus mobilization	1 Year
Blankets (Some Come Impregnated w/Seed)	Various Types of Pre-made Erosion Control Blankets	Rolled Out and Staked or Pinned Down	By the Sq. Ft.	Effective, netting decomposes at a different rate than mulch. Expensive.	\$.49–3.50 Sq. Yd. for Material Only; Add Labor	2 Years
Netting	Various Types of Biodegradable and Nondegradable Netting	Rolled Out and Staked or Pinned Down, Over Mulch	By the Sq. Ft.	Can trap animals, decomposes slowly; used over mulch; Biodegradable types are available.	\$.20–.50 Sq. Yd. for Material Only; Add Labor	2 Years
Channel Liners	Various Width Heavy Duty Blankets	Rolled Out and Staked or Pinned Down	By the Sq. Ft.	Effective, usually left in place. Very expensive.	\$3.00–3.50/Sq. Yd. for Material Only; Add Labor	3 Years
Tackifiers	Sprayed on Material Used to Hold Soil in Place	Sprayed on, Usually w/a Truck Mounted Sprayer	By the Sq. Ft.	Short Term	\$800/ac plus Mobilization	1 Year
Sodding	Grass Sod	Rolled Out and Pinned Down	By the Sq. Ft.	Used when instant plant establishment is important.	\$.17/Sq. Ft.; Add DELIVERY and Labor	Indefinite

Summary of Representative Costs For Mulches, Tackifiers, Erosion Control Blankets And Geomatrixes ¹

Product	Width (ft)	Length (ft)	Area (sq. ft.)	Weight (lb.)	Cost/unit
Enkamat	3	277	831	69	\$781/roll
Curlex	4	180	720	78	\$46/roll
Hi-V curlex	4	100	400	72	\$48/roll
Am-Tak	Recommended rate 90/lbs./acre @ 2:1 slope				\$60/40 lbs.
ExcelFiber mulch with tackifier					\$240/ton
without tackifier					\$210/ton
Bio-D-mat	6.5	165	1072.5	100	\$250/roll
Armater					
Geomatrix	39.4	41	1615	88	\$1159/unit
S1 (single side netting)					
Straw Blanket	7	90	630	45	\$37/roll
S2 (double sided netting)					
Straw Blanket	7	90	630	45	\$48/roll
CS2 (double sided netting)					
Coconut and Straw Blanket	7	90	630	45	\$66/roll
CS (double sided netting)					
100% Coconut Blanket	7	90	630	45	\$83/roll
SFB Synthetic Blanket	7	90	630	50	\$234/roll
Blanket Staples					
6" x 1" gauge wire					\$25/1000

¹ Prices (as of 1/95) are representative and may vary depending on the product and supplier.
Does not include delivery. Contact your local supplier.

APPENDIX I: MANAGEMENT METHODS

Table I-1. Application rate and timing of application for most effective herbicides on noxious weeds (Additional management guidelines for other weed species can be found in the PNW Weed Management Handbook (<http://weeds.ippc.orst.edu/pnw/weeds>)).

Weed Species	Plant biology	Herbicide (trademark)	Herbicide Rate/Acre	Herbicide Application Timing	Comments
Canada thistle	Perennial/Deep-rooted Rhizominous	Milestone Tordon 22K Redeem 2,4-D ¹	5 to 7 fl oz 1.5 to 2 pints 3 pints 2 quarts	Bolt to bud, or fall Bolt to bud Bolt	Can use up to waters edge – do not get in water Do not apply to shallow groundwater areas Suppression of top-growth only – will not kill roots
Cinquefoil Sulfur (Erect)	Perennial/ Tap-rooted	Milestone Tordon 2,4-D	5 to 7 fl oz 1 pint 2 quarts	Active growth Active growth Rosette to bud	Can apply to waters edge – do not get in water Do not apply to shallow groundwater Apply before flower growth stage
Common tansy	Perennial/ Rhizominous	Cimarron 2,4-D	0.5 oz 2 quarts	Bolt to bud Bolt	Use with a non-ionic surfactant Suppression of top-growth only – will not kill roots
Dyers woad	Perennial/ Tap-rooted	Cimarron Telar Plateau	0.5 to 1 oz 0.5 to 1 oz 8 fl oz	Rosette to bud Pre-bud	Use with a non-ionic surfactant Use with a methylated seed oil surfactant @ 1 qt/ac
Field bindweed	Perennial/Deep-rooted Rhizominous	Tordon 22K + 2,4-D Tordon 22K 2,4-D	1 quart + 1 quart 1 quart 2 quarts	12" of growth, or fall 12" of growth, or fall 12" of growth	Do not apply to shallow groundwater areas Suppression of top-growth only – will not kill roots
Hawkweed Meadow	Perennial/Shallow-rooted/ Rhizominous	Milestone Tordon 22K Redeem 2,4-D	4 to 7 fl oz 1 pint 3 pints 2 quarts	 Bolt to bud Bolt to bud Rosette	Can apply to waters edge – do not get in water Addition of N fertilizer may improve control. Do not apply to shallow groundwater areas Suppression only, apply with N fertilizer
Houndstongue	Tap-rooted	Cimarron 2,4-D	0.5 to 1 oz 2 quarts	Rosette to late bud Rosette	Use with a non-ionic surfactant Must apply before bolting growth stage
Knapweed Spotted Diffuse	Tap-rooted	Milestone Redeem Tordon 22K 2,4-D	5 to 7 fl oz 2 pints 1 pint 2 quarts	Actively Growing Rosette to bud Actively growing Rosette to bolt	Can apply to waters edge – do not get in water Do not apply to shallow groundwater areas Apply annually for at least 2 years
Knapweed Russian	Perennial/Deep-rooted Rhizominous	Milestone Tordon 22K 2,4-D	4 to 7 fl oz 1 to 1.5 quarts 2 quarts	Bolt to bud, or fall Bud, flower or fall Bolt to bud	Can apply to waters edge – do not get in water Do not apply to shallow groundwater Suppression of top-growth only – will not kill roots
Leafy spurge	Perennial/Deep-rooted Rhizominous	Tordon 22K Plateau 2,4-D	1 to 1.5 quarts 8 to 10 fl oz 2 quarts	Full flower or fall Fall or prior to first frost early flower	Do not apply to shallow groundwater areas Use with either a non-ionic or methylated seed oil surfactant Suppression of top-growth only – will not kill roots

¹ The 2,4-D rate is based on a one gallon container of 2,4-D having 4 lbs of active ingredients.

Oxeye Daisy	Perennial/Shallow-rooted/ Rhizominous	Cimarron	0.5 oz	Rosette to early flower	Use with a non-ionic surfactant
		Milestone	5 to 7 fl oz	Rosette to early flower	Can apply to waters edge – do not get in water , Addition of N fertilizer may improve control.
		Tordon 22K	1 pint	Rosette to early flower	Do not apply to shallow groundwater sites
		2,4-D	2 quarts	Pre-bud	Suppression only, apply annually for several yrs
Perennial pepperweed	Perennial/ Deep-rooted Rhizominous	Cimarron	0.75 to 1 oz	Bud to flower	Use with a non-ionic surfactant
		Telar	1 oz	Bud to flower	
		Plateau	8 to 10 oz	Flower	Use with a methylated seed oil surfactant @ 1 qt/ac
		2,4-D	2 quarts	Bolt to Pre-bud	Suppression of top-growth only – will not kill roots
Purple loosestrife	Perennial/ Rootstock	Cimarron	1 oz	Pre-flower	Use with a non-ionic surfactant; do not get in water
		Glyphosate	2 quarts	Pre-flower	Use aquatic label glyphosate such as Rodeo and add an approved surfactant.
		2,4-D	2 quarts	Spring - <15% growth	Suppression of top-growth only – will not kill roots
St. Johnswort	Perennial/Deep-rooted Rhizominous	Tordon 22K	1 to 1.5 pint	Pre-flower	Do not apply to shallow groundwater areas
		2,4-D	2 quarts	Seedling to pre-flower	May have to apply annually for at least 2 years
Tall buttercup	Perennial/ Rhizominous	Milestone	4 to 6 fl oz	Seedling to early flower	Can apply to waters edge – do not get in water
		MCPA Amine	2 quarts	Rosette to early flower	May need to treat annually for several years
Tamarisk Mature tree	Woody tree	Arsenal Remedy	1% solution	Apply to foliage	Apply 1.3 oz herbicide/gallon water
			25% solution (crop oil)	Apply to cut stump	Cut tree and apply herbicide within 10 minutes to cut stump: 1 part Remedy to 3 parts veg. crop oil
Young tree		Remedy	20% solution (crop oil)	Apply to basal bark	Spray 12 to 18 inches of tree bark with herbicide solution: 1 part Remedy to 4 parts veg. crop oil
Tansy ragwort	Perennial/ Rhizominous	Milestone	5 to 7 fl oz	Seedling to pre-bud	Can apply to waters edge – do not get in water; will damage conifer trees
		Tordon 22K	1 pint	Actively growing	Will damage conifers – do not apply to shallow groundwater
		Transline	1 pint	Actively growing	Clip flowers prior to treating to stop seed production – safe to use in conifer trees
		2,4-D	2 quarts	Seedling to rosette	Not effective when applied at flower stage
Toadflax Dalmatian Yellow	Perennial/ Rhizominous	Tordon 22K	1 to 2 quarts	Flower or fall	Do not apply to shallow groundwater areas
		Telar	1 oz	fall	Use 2 qts on yellow toadflax for spot treatment
		Tordon + Telar	1 quart + 1 oz	fall	Use with a non-ionic surfactant
Whitetop (hoary cress)	Perennial/ Rhizominous	Cimarron	0.2 to 0.75 oz	Pre-bud	Use with a non-ionic surfactant
		Plateau	8 fl oz	Pre-bud	Use with a methylated seed oil surfactant @ 1 qt/ac
		2,4-D	2 quarts	Pre-bud	Suppression of top-growth only – will not kill roots

Table I-2: Effect of manual, mechanical, and biological methods on noxious weeds. Additional information on biological agents can be found in Biological Control of Invasive Plants in the United States (Coombs et al. 2004).

Weed Species	Hand-pulling	Tillage	Mowing	Biological Agents
Leafy spurge	Stops seed production, will not control plant	Tillage will spread root fragments	Must be mowed every 3 to 4 weeks to stop seed production; no plant control	13 agents available for release; <i>Aphthona</i> sp. most suited to effective IWM
Canada thistle	Stops seed production, will not control plant	Tillage will spread root fragments	Must mow 2 X/year to obtain limited plant control; can reduce seed production if mowed at bud	3 insects available; limited success in Montana
St. Johnswort	Only effective on young, isolated plants	Repeated tillage effective	Reduce seed production if mow at bud stage; no plant control	4 insects available; limited success in MT
Dalmatian toadflax	Effective on small infestations; must be done for 5-6 consecutive years.	Must be repeated every 7 to 10 days for 2 yrs to be effective	Reduce seed production if mow at bud stage; no plant control	6 insects available; stem mining weevil effective
Whitetop (hoary cress)	Somewhat effective on newly established plants; must pull for 4 consecutive years	Tillage will spread root fragments	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Perennial pepperweed	Stops seed production, will not control plant	Tillage will spread root fragments	Mowing 2 times per season stopped seed production (N. CA)	No biocontrol agents available
Oxeye Daisy	Individual plants can be dug successfully	Controlled with multiple tillage	Reduce seed production if mow at bud stage; may stimulate lateral growth	No biocontrol agents available
Hawkweeds	Not effective, digging spreads root fragments	Tillage will spread root fragments	Stimulates lateral growth	Under screening and evaluation; no agents currently available
Tall buttercup	Individual plants can be removed by hand-pulling	Repeated tillage effective	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Sulfur cinquefoil	Difficult to hand pull; digging is effective on individual plants	Controlled by tillage	Reduce seed production if mow at bud stage; no plant control	No biocontrol agents available
Spotted and diffuse knapweed	Hand pulling effective on small, scattered infestations	Controlled by tillage	Reduce seed production if mow at bud stage; no control to very limited plant control	13 insects introduced for biological management; insects established, some success
Russian knapweed	Stops seed production, will not control plant	Tillage will spread root fragments	Reduce seed production if mow at bud stage; no plant control	A gall-forming nematode, <i>Subangina picridis</i> , has been released – limited impact
Rush skeletonweed	Stops seed production, will not control plant unless done 2-3 times/yr for 6-10 yrs	Tillage spreads root fragments	Limits seed production in dry years	3 insects available; 1 fungus

APPENDIX J. CONSIDERATIONS FOR SEEDING

USFS, Region 1: Native Plant Handbook

(Revised for roadsides by C. Duncan February 27, 2002)

Establishing plants on disturbed roadside areas can be difficult. It requires time and patience to establish healthy, weed resistant plant communities. Setting realistic goals and addressing the economic and biological feasibility of the project will determine success or failure of any native revegetation endeavor. Following are a few considerations.

Seed Quality

Seed used should be of known origin. Seed purchased commercially should have an analysis label that states the following:

Species or variety of seed.

Purity: The amount of material in a bag that is the seed. The rest is inert matter, weed seed, or other seed. Most seed should be no less than 75% pure, and preferably over 85% pure.

Weed Seed Content: The tag should state that NO noxious weeds are present. Only certified weed seed-free seed be used.

Germination: The higher the germination the better. Germination should not be less than 65% for most species, although some shrubs and forbs will have less. Total germination may be followed by (TZ) which means that a staining technique using tetrazolium chloride was used to evaluate the viability rather than a true germination test. This is generally accepted as a substitute for an actual test. Be sure to look at the germination test date. If it is over a year old, expect to get lower germination. Seed must be stored properly to retain its viability. If stored improperly, viability can decrease rapidly.

Pure Live Seed (PLS): Most species are sold on a PLS basis. Calculations for seeding rates (see example below) should be done on a PLS rate, rather on Lbs per acre. PLS is simply the percent purity multiplied by the percent germination (% purity x % germination).

How to use PLS: If the plan calls for so many lbs of PLS per acre, how much bulk seed is needed? To calculate this amount, divide the PLS percentage into the number of pounds recommended.

Example: You want to plant 5 lbs of Idaho Fescue per acre. The analysis label indicates 85% purity and the germination is 79%.

$$.85 \times .79 = .67 \text{ PLS.}$$

Divide .67 into 5 lbs/acre = 7.5 lbs of BULK seed/acre.

Time of seeding

Seeding should be done when there is adequate moisture to assure seedling establishment. Generally this is in the early spring or late fall. Seed early enough in the spring to take advantage of adequate moisture and cool temperatures. Spring seedlings are often unsuccessful because seeding is delayed when excess soil moisture prevents equipment from accessing the project site. When the equipment can get into the site, it may be too late for optimum seedling establishment.

Fall seeding needs to occur late enough so that germination does not occur until the following spring. Summer and early fall seeding is very risky since adequate establishment prior to heavy frosts and winter conditions is questionable. During the winter, exposed seedlings (not covered by snow) will experience high mortality.

Seedbed preparation

The best seedbed is firm, fine, moist, and free from excessive competition. It is extremely important to have a firm seedbed to reduce air space and ensure that germinating seed contacts moist soil. Seed placed on hard seedbeds where there is high competition from existing plants will generally fail. If topsoil is present, leave it in a roughened condition. Subsoiling or chiseling may be necessary to break up hard subsoil layers. The use of soil cultivators that decrease soil compaction can be very beneficial, as opposed to backhoes or rippers that can just breakup the surface soil, leaving compacted soil layers underneath. If soil crusting has occurred on the surface soils prior to seeding, the crusting must be broken up and the application of a mulch and tackifier should be utilized. If rainfall has occurred on disturbed areas prior to seeding, crusting has probably occurred.

Stockpiling the organic layer and topsoil during construction activities for redistribution later is critical. One of the biggest problems on roadside restoration projects is the lack of organic matter and nutrients needed by the plants. Sampling soil pH, bulk densities, and nutrient levels present on and in the seedbed will provide information to help decide if soil amendments, mulches, fertilizers, or other cultural treatments are necessary.

Seeding rates

The following is an example of seeding calculation.

Revegetation and Stabilization of Disturbed Areas - Grass/Forb/Shrub Mix LBS. PLS/ACRE ¹

Species	% PLS	Seeds/Lb.	Seeds per sq. ft	Sow Rate Lbs./acre
Grass A	80	150,000	14	5.0
Grass B	76	572,500	40	4.0
Grass C	89	241,000	10	2.0
Forb A	80	4,124,000	19	.25
Forb B	70	286,000	5	1.0
Forb C	80	30,000	3	5.0
Shrub A	65	4,000	.1	2.0
Shrub B	70	356,000	.5	.1
Total	91.6	19.35		

¹ Rates for broadcast seeding. Target rate is for 75 – 125 seeds/sq. ft. with grass/forb/shrub mixes.

% PLS = % Purity x % Germination

Seeds per square foot = Seeds/Lb. x % PLS x recommended lbs./acre x 1/43560.

Lbs./acre = target seed/ft x 43560 sq. ft./acre x 1/(seed/lb. x PLS).

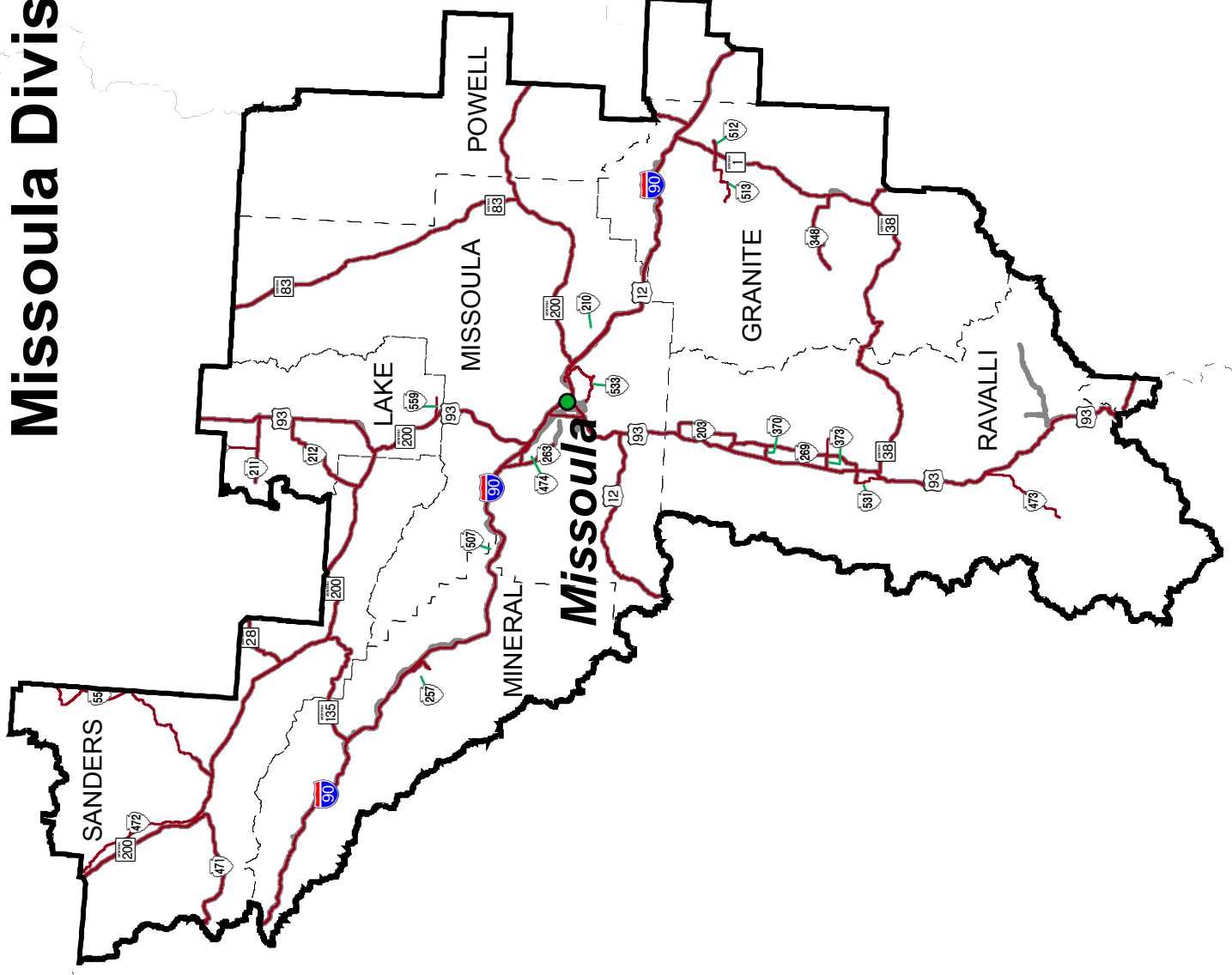
REMEMBER: Increasing seeding rate will NOT make up for poor seedbed preparation, harsh sites, poor seeding methods, or improper timing of seeding. Follow the recommended rates. In general, PLS per sq. ft. targets need to be determined by a restoration ecologist or botanist. For dry acres PLS/sq. ft. rates will be lower than very wet areas.

APPENDIX K. WEED TREATMENT EFFECTIVENESS MONITORING FORM

Inspection Information:					
Monitoring Date:		Name(s) of person collecting data:			
Route Information					
Road Name	System/Route	Start	End Mile Marker	Miles Inspected	
Treatment Information					
Treatment Date	Target species	Treatment	Rate	Growth Stage	
Criteria:			Yes	No	Comments/Notes
Was the weed population adequately suppressed?					
Was the planned procedure used, if not, why did it vary from the original plan?					
Were weed management costs equal to or less than projected costs?					
What was the effect on the target weed?					
Were there any side-effects to non-target organisms from the treatment?					
Should the treatment be repeated or modified?					
Was funding and manpower available at the appropriate time & were they adequate?					
Was personnel training adequate?					
Were additional problem areas identified?					
Additional Notes & Comments (Use back of form if needed):					

APPENDIX L. MONTANA DEPARTMENT OF TRANSPORTATION MAINTENANCE DIVISIONS

Missoula Division

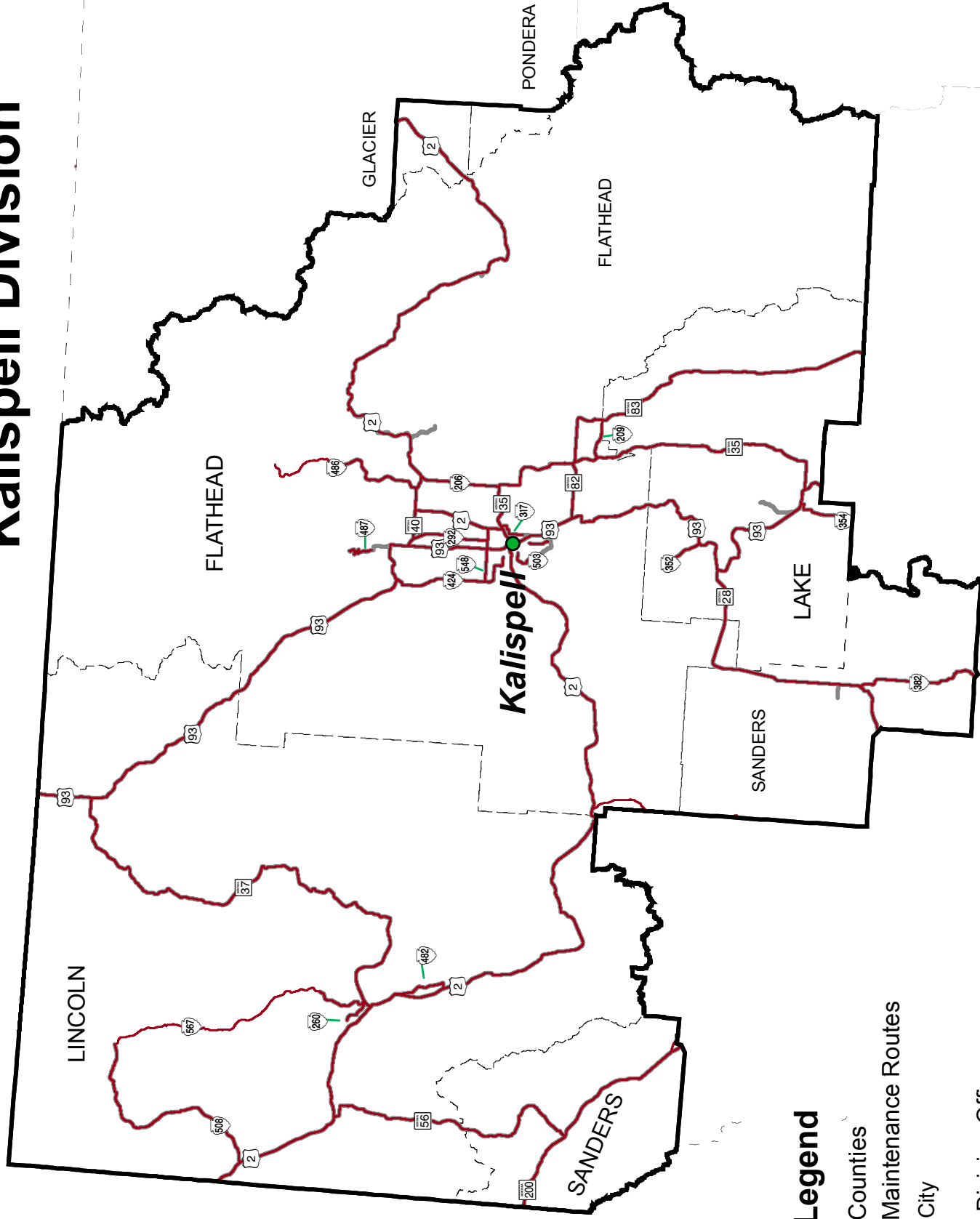


Map Legend

- Counties
- Maintenance Routes
- City

Missoula Division Office
Phone: 406-523-5800

Kalispell Division






Map Legend

- Counties
- Maintenance Routes
- City

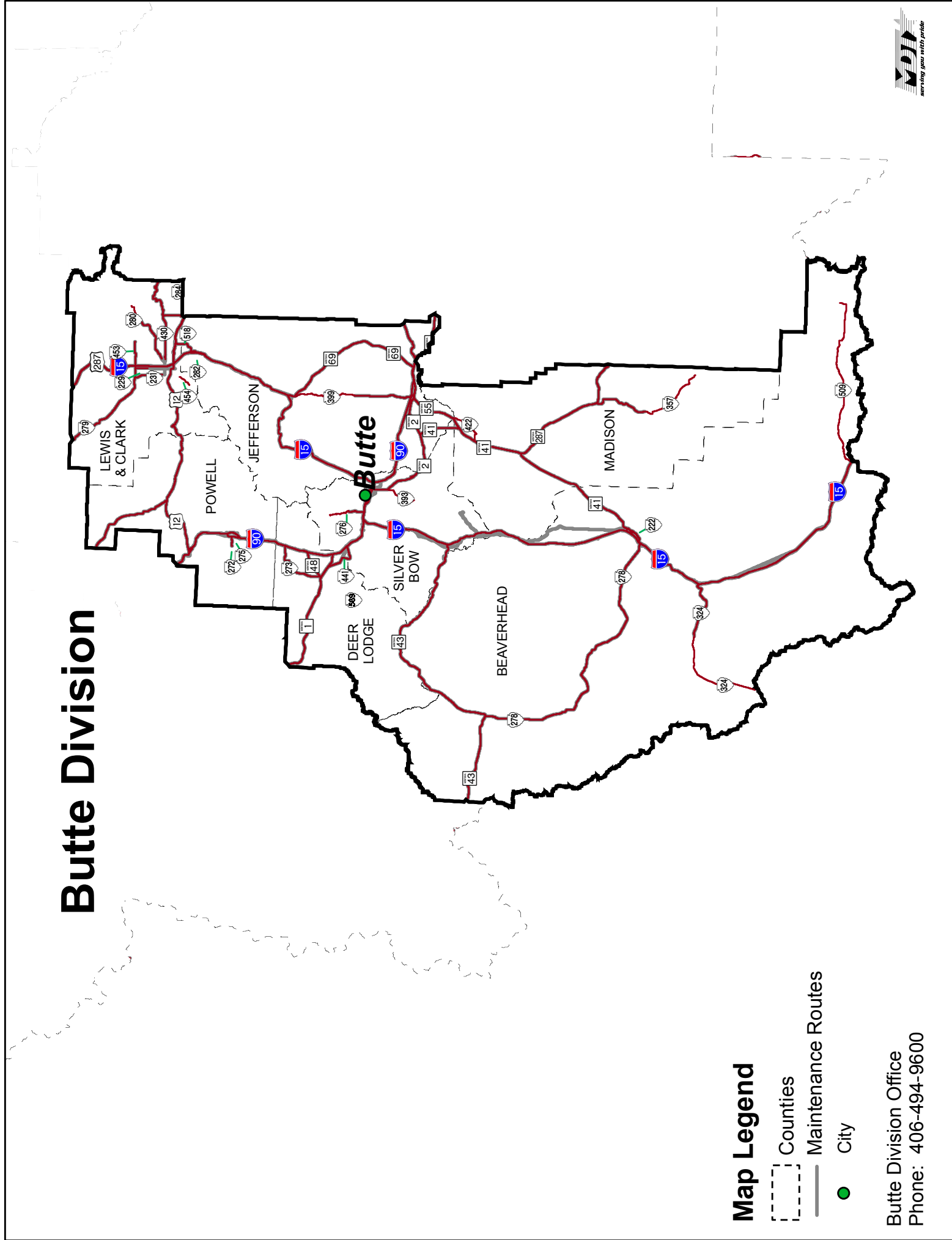
Kalispell Division Office
Phone: 406-751-2000

Butte Division

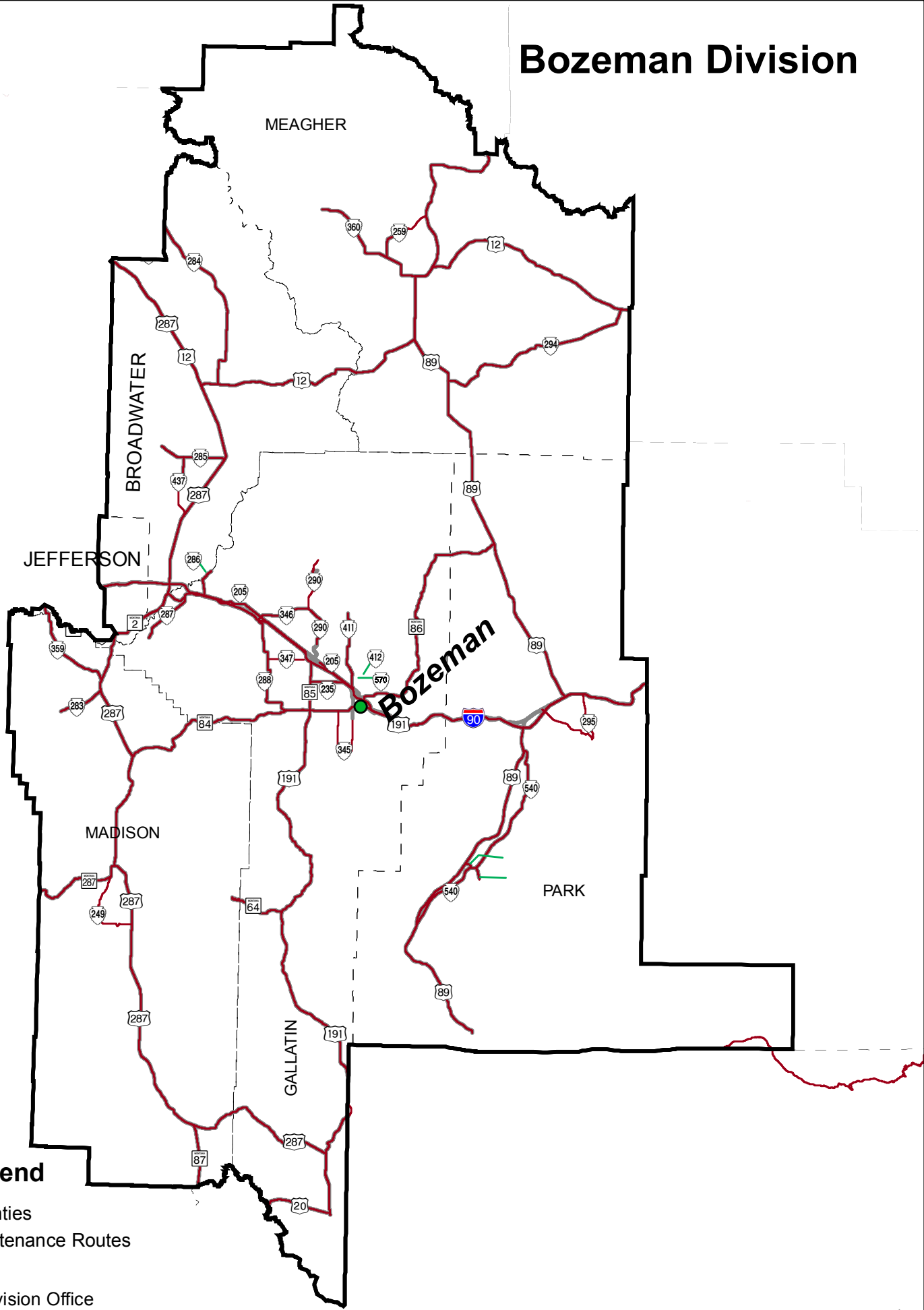
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-  Maintenance Routes
-  City

Butte Division Office
Phone: 406-494-9600



Bozeman Division



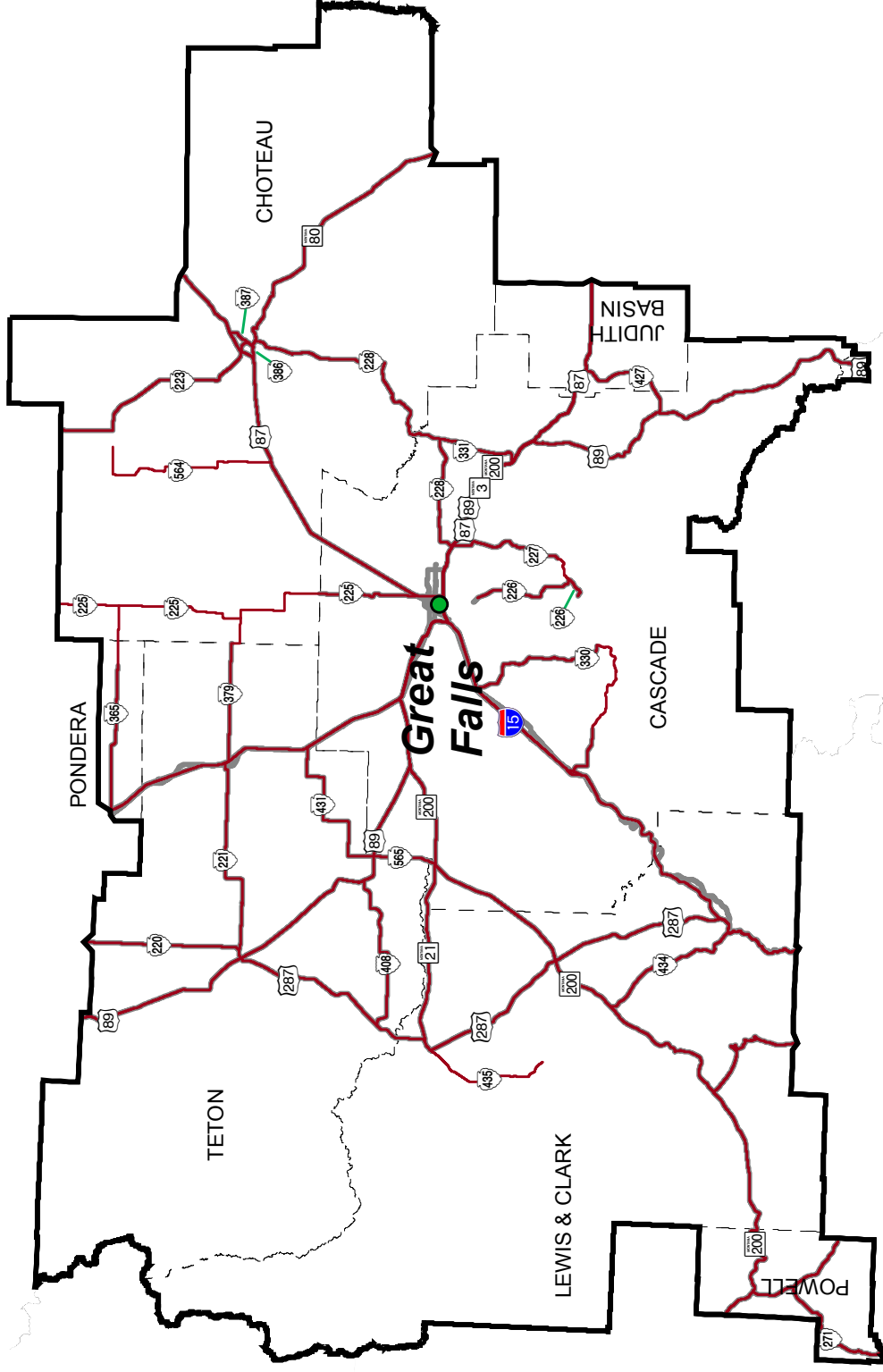
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Bozeman Division Office
Phone: 406-556-4700



Great Falls Division

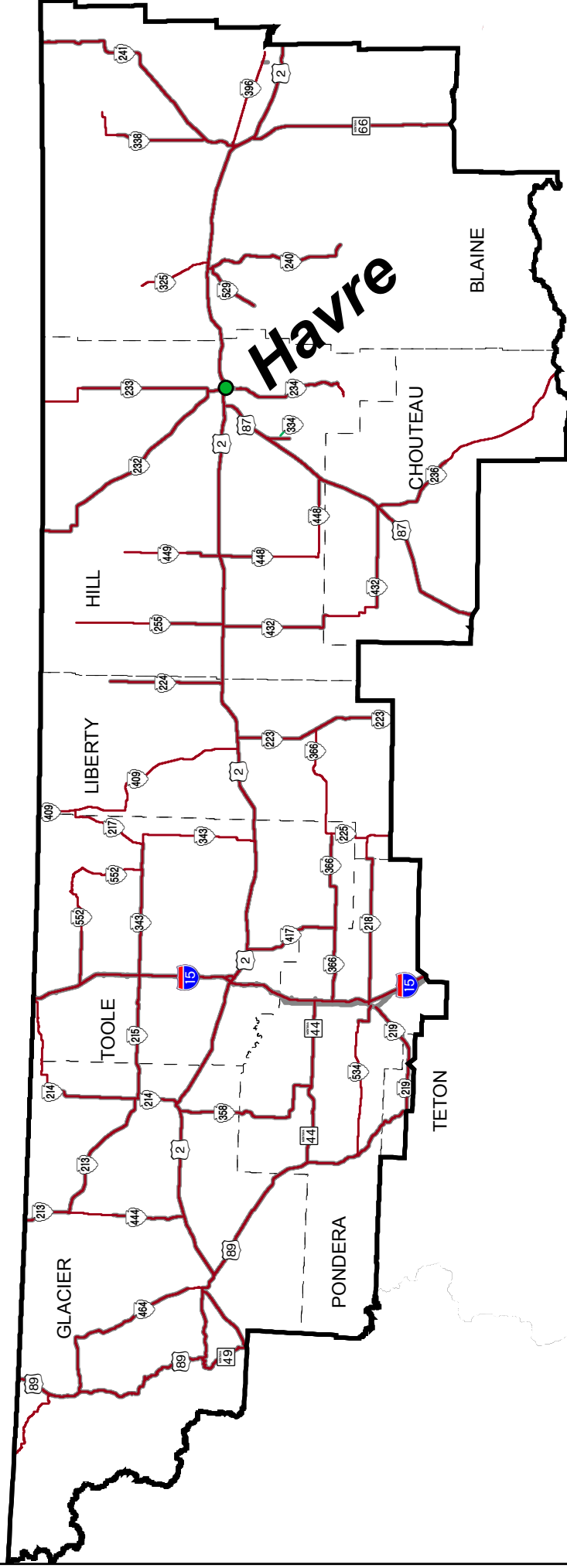


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Great Falls Division Office
Phone: 406-454-5800

Havre Division

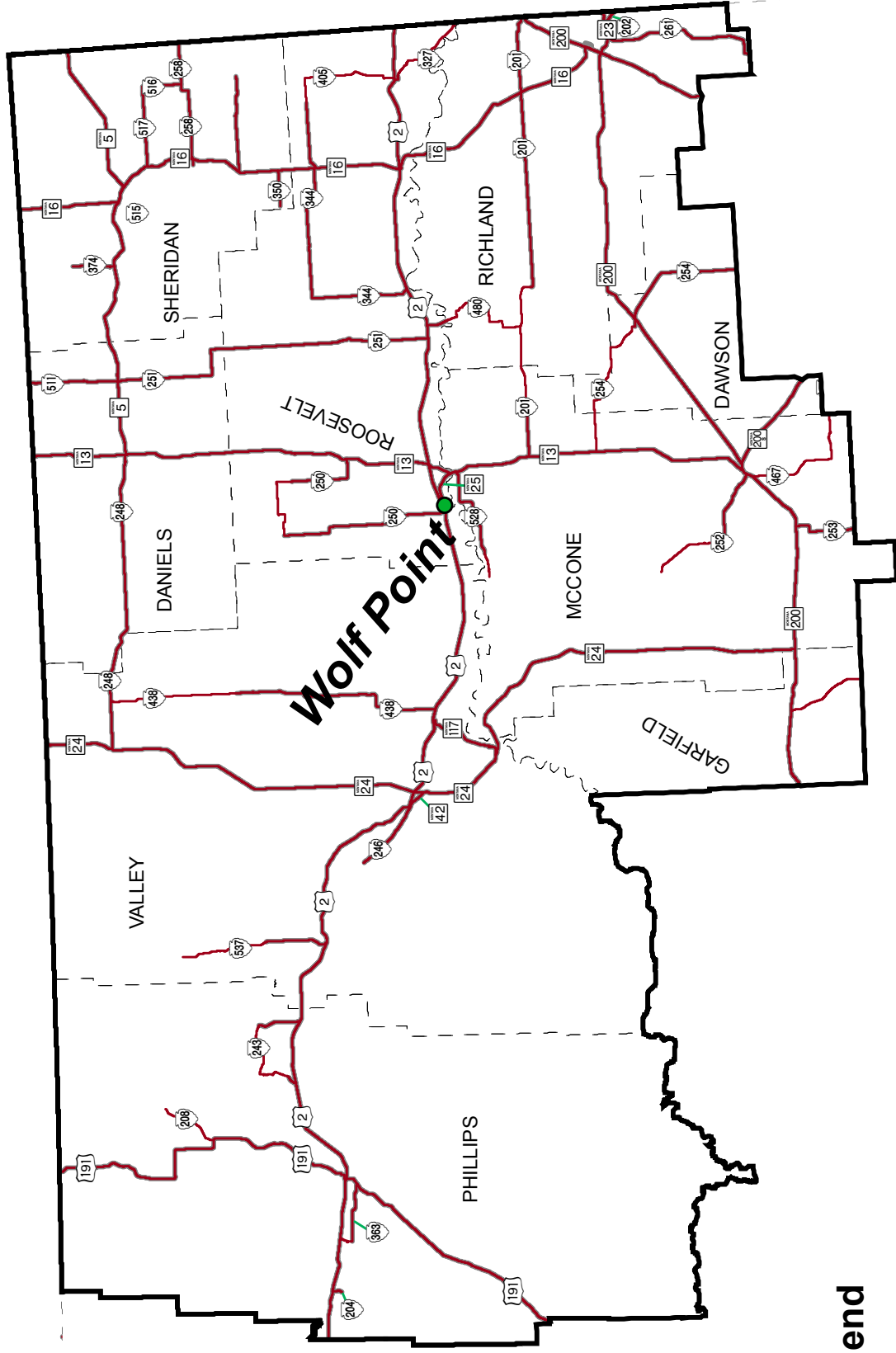


Map Legend

- Counties
- Maintenance Routes
- City

Havre Division Office
Phone: 406-262-5500

Wolf Point Division



Map Legend

- Counties
- Maintenance Routes
- City

Wolf Point Division Office
Phone: 406-653-6700



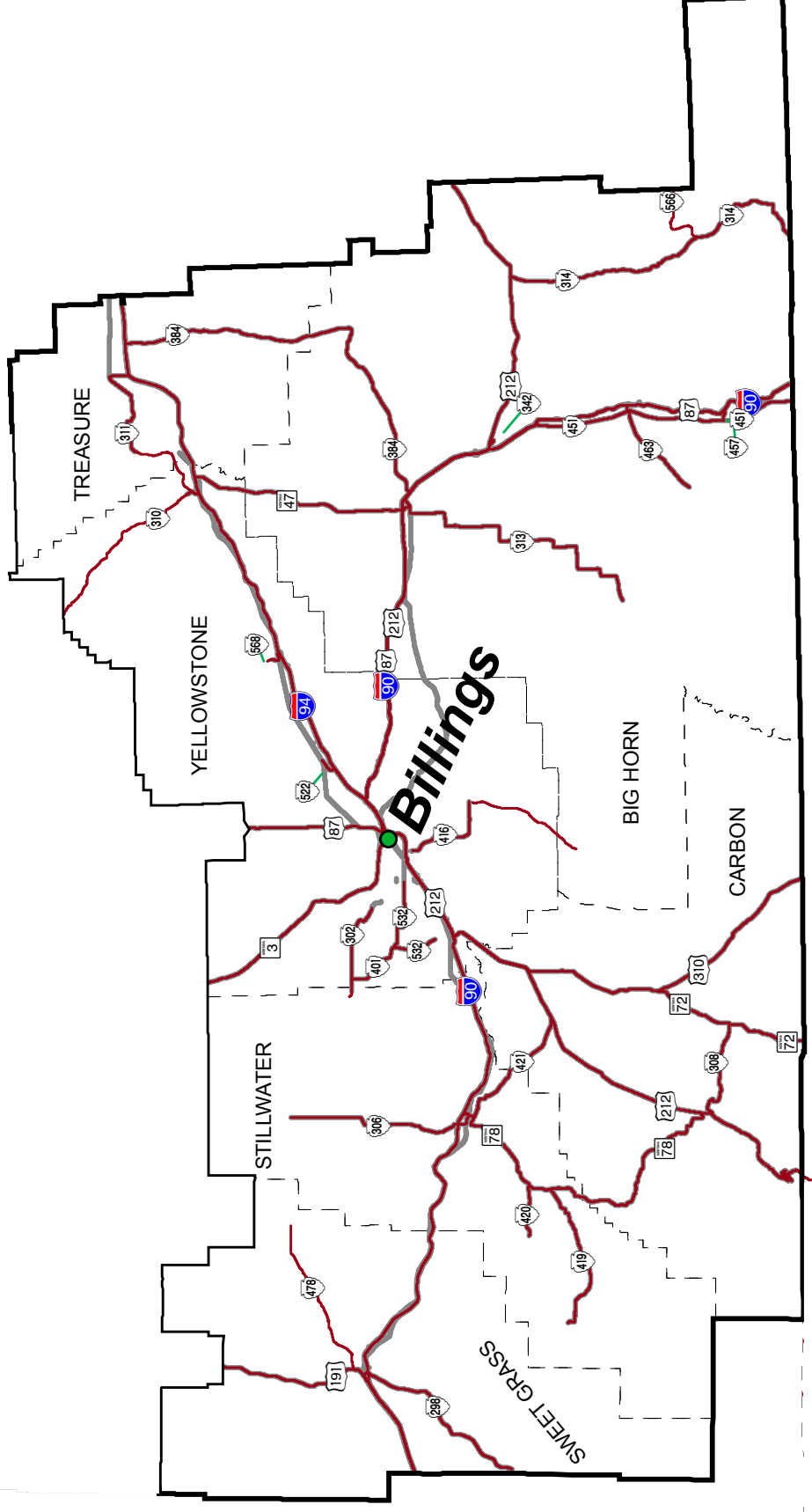
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- Counties
Maintenance Routes
City

Miles City Division Office
Phone: 406-233-3600

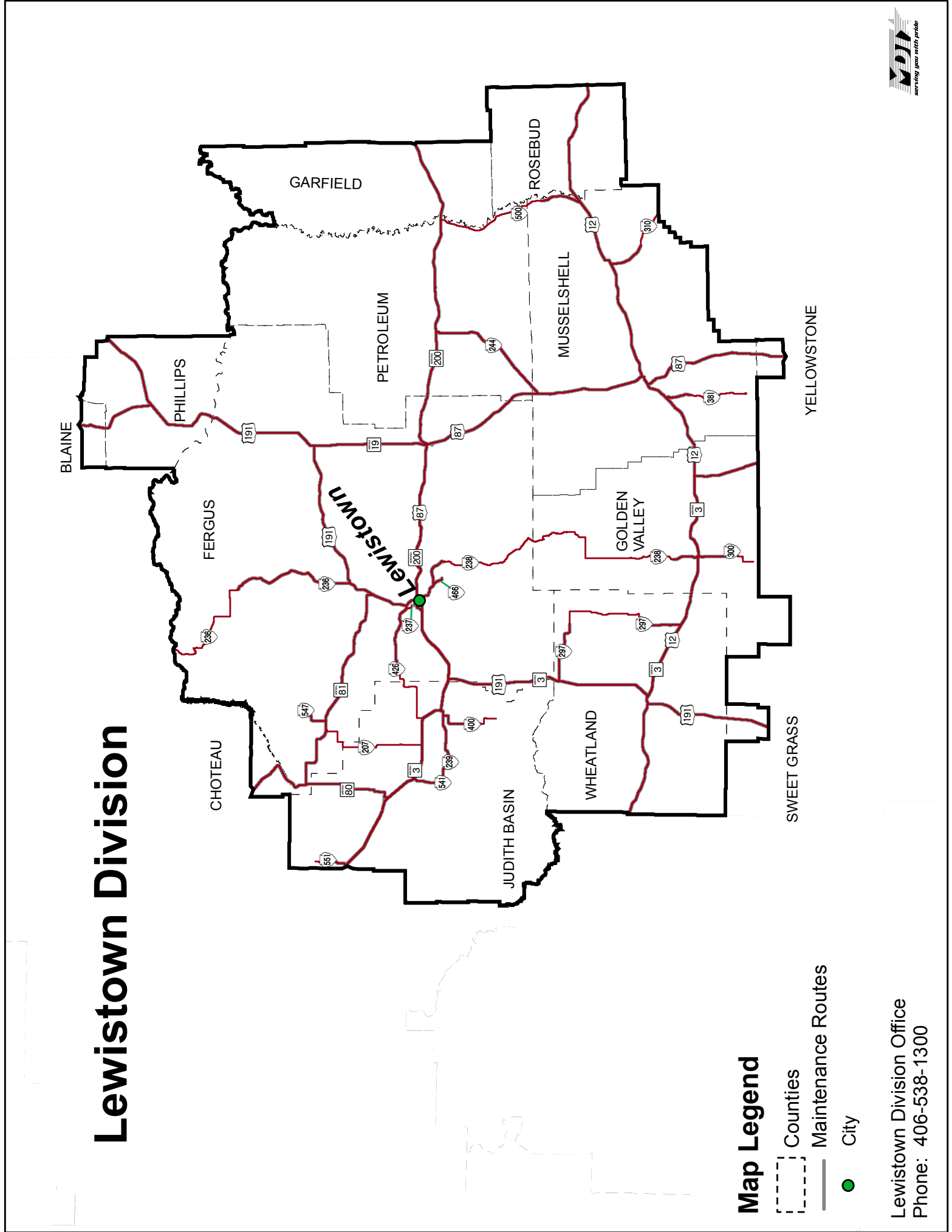
Billings Division



Map Legend

- Counties
- Maintenance Routes
- City

Billings Division Office
Phone: 406-252-4138



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